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Abstracts

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Aims and Scope

Trauma causes individual patterns of injury and involves shock, fractures, soft tissue and organ injuries. Treatment therefore requires the joint effort of emergency medicine, orthopedic and trauma surgery, critical care medicine and rehabilitation. Both scientific progress and the in-depth experimental and clinical research within individual disciplines contribute to the ongoing continuous improvement of trauma care.

The EUROPEAN JOURNAL OF TRAUMA AND EMERGENCY SURGERY aims to open an interdisciplinary forum that allows for the scientific exchange between basic and clinical science related to pathophysiology, diagnostics and treatment of traumatized patients. The journal covers all aspects of clinical management, operative treatment and related research of traumatic injuries.

Clinical and experimental papers on issues relevant for the improvement of trauma care are published. Reviews, original articles, short communications and letters allow the appropriate presentation of major and minor topics. The papers published are allocated to one of the following sections of the journal:

Biomaterials, Experimental Research, Foot and Ankle Trauma, Hand Trauma, Intensive Care, Neurotrauma, Pediatric Trauma, Pelvic Trauma, Polytrauma, Reconstructive Surgery, Spine Trauma, Sports Injuries, Thoracic and Abdominal Trauma, Upper and Lower Extremity.

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SHOULDER

S001 Fractures of the Clavicle: Operative Treatment as New Standard?

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Introduction: Frequently fractures of modern sport disciplines are fractures of the clavicle. Most of them are uncomplicated and still treated without operation. Therefore there is a lack of bigger studies about the treatment of clavicle fractures by elastic stable intramedullary nailing (ESIN). Nevertheless this method becomes more and more popular, especially for young and active people. Intention of this investigation was to analyze risks and results of this method to check the indication for operative treatment of simple fractures in this group of patients.

Material and Methods: This study is a retrospective analysis of 33 patients whose fractures of the clavicle were treated by intramedullary nailing. Crucial for the decision for operation was the individual request of the patient after information of the relative indication. Included were 26 patients with fractures of the middle third, 4 fractures of the lateral third and 3 fractures with concomitant shoulder injuries from 2004 to 2008. The duration of operation, intraoperative radioactive loading and complications were analyzed from the medical file. The functional outcome was measured by the CONSTANT-Score. The anatomical reduction was proved by measuring the difference of the length of both clavicles (3 – 48 month after operation).

Results: The average duration for the middle third was 66 min (22-163), for the lateral third 73 (59-100) minutes and for fractures with concomitant injuries 65 min (21-101). The mean radioactive surface dose was 1,19 cGy/cm². Four complications (12%) cause revision operations: one secondary dislocation which leads to pseudarthrosis and two imminent penetrations of the medial end of the nail. One patient had developed a painful pseudobursa due to lateral penetration of the nail. Additional there were two prematurely nail extractions because of medial irritation of the soft tissue. Altogether we documented complications in 18% of the operations. Overall an open reduction was necessary in 37%. After healing there has been no significant shortening of the fractured clavicle in comparison of both sides. The CONSTANT-Score showed good postoperative results (average: 96, median: 100, lowest 75/100).

Conclusion: ESIN with titan nails is an alternative method of treatment with good results. Nevertheless we documented complications in 18%. In the literature complication rates from 4 – 31% has been described. The complication rate of ESIN seems to be comparable to the conservative treatment. In our opinion the relevant intraoperative radioactive dose is an often underestimated factor. The operation time is often longer than thought before starting and often an open reduction is necessary. Because of these reasons the conservative therapy should still be the standard. ESIN can be an alternative especially for young athletic ambitious patients after a detailed information about the risks.

Disclosure: No significant relationships.

S002 Plate Fixation Versus Nonoperative Treatment of Displaced Midshaft Clavicular Fractures. A Prospective Multi-center Clinical Trial

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Introduction: The optimal management of clavicle fractures is still controversial, although the nonoperative treatment remains the standard in most fractures. Recent studies have reported a higher nonunion rate and unsatisfactory functional results after nonoperative treatment. Therefore, there is an increasing interest in the primary operative management of displaced midshaft fractures. However, no treatment-consensus exists at this moment. The goal of the present study was to compare plate fixation with nonoperative treatment of displaced midshaft clavicle fractures in adults with a minimum of 24 weeks follow-up.

Material and Methods: In a multi-center prospective clinical trial patients with a fully displaced midshaft clavicle fracture were included within one week after the injury. After a standard information procedure, patients were asked if they wanted to have a operative or a nonoperative treatment. Outcome analysis included standard clinical follow-up, the Constant shoulder score, the Disability of the Arm, Shoulder and Hand (DASH) score and complication rate at 6 and 24 weeks after the injury.

Results: Between January 2008 and October 2009 a total of 93 patients were included: 41 patients were treated operatively (90.2% men, mean age 41.5 years) and 52 patients were treated nonoperatively (82.7% men, mean age 40.9 years). Constant and DASH scores were significantly higher in the operative group compared with the nonoperative group at 6 weeks (92 vs 78 and 13.1 vs 26.5). There was no significant difference at 24 weeks (97 vs 95 and 5.6 vs 6.4). In both groups two patients developed pseudarthrosis, all four required surgery. In the nonoperative group symptomatic malunion was more frequent: twelve patients at 24 weeks (23.0%) versus none in the operative group. Other complications in the operative group were mostly hardware related: pain and irritation requiring plate removal after consolidation in four patients (9.8%), two broken plates due to the earlier mentioned pseudarthrosis (4.9%), one early outbreak of the plate (2.4%) and one woundinfection (2.4%). Furthermore, patients with heavy professional work activities returned to their jobs at an average of three weeks after injury in the operative group compared with seven weeks in the conservative group. At 24 weeks after the injury, the patients in the operative group were more satisfied compared to those in the nonoperative group (56% vs 46%).

Conclusion: Operative fixation of a displaced midshaft clavicle fracture results in improved functional outcome at 6 weeks after injury and in a higher satisfaction rate at 24 weeks. This study shows that patients with heavy jobs restarted their professional activities sooner if they were treated operatively. Furthermore, higher satisfaction with the appearance of the shoulder may be a reason for surgery.

Disclosure: No significant relationships.

S003 Minimal Invasive Plate Osteosynthesis (MIPO) of Clavicle Fracture with Locking Plate (LCP)

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Introduction: The unstable shoulder girdle with a fracture of the clavicle (floating shoulder, ipsilateral serial rib fractures) is a classical indication for a plate osteosynthesis of the clavicle. Despite a relatively high complication rate (5-30%), such as implant failure, non-union and refracture after implant removal, open reduction and internal plate fixation (ORIF) has been the gold standard for many years. This open procedure with direct reduction manoeuvres might be blamed for at least some of the complications due to iatrogenic damage of the blood supply of the fracture fragments. Our hypothesis is that a closed method with indirect reduction might reduce some of the complications. The goal of our study was to test the practicability of the MIPO-technique in clavicle fractures in unstable shoulder girdles.

Material and Methods: Between 2001 and 2009 we included, out of internally fixed 130 shaft fractures in total (66x plate, 64x elastic nail), 18 patients with either a floating shoulder (n = 8) or a clavicle fracture in combination with ipsilateral serial rib fractures (n = 10), in this study. Operative technique: A locking compression plate (LCP) 3.5 with 10-12 holes was anatomically shaped to the anterior (-caudal) contour of the contralateral clavicle and then inserted percutaneously from lateral to medial using a short incision at the anterior border of the lateral end of the clavicle. Using mainly indirect manoeuvres, the fracture was reduced and then fixed in a pure bridging technique never using interfragmentary lag screws. Free unloaded ROM was allowed immediately after the operation with full loading 6-12 weeks later. Follow-up examination was performed 1 to 4 years later with clinical (DASH-score, shoulder function, length measurement) and radiological (fracture healing, length measurement) examination.

Results: 17/18 fractures healed without complications. Clinical and radiological length measurement showed no significant differences to the contralateral side (range: +5 mm to -5 mm). In all patients a very good functional result was achieved with an average DASH score of 4.2 (0-18). One implant failure occurred two years after the initial trauma in a road workman. At reoperation only a partial consolidation of the original fracture was observed. Restabilization and bone grafting led to an uneventful healing.

Conclusion: The MIPO technique is feasible even in clavicle fractures and can lead to good functional and cosmetic results. The advantage might be its low invasiveness which better preserves the vascular supply of the fracture fragments. However it is technically demanding mainly due to the small size of the fractured bone. Therefore in our opinion it requires a surgeon experienced in the MIPO technique of treating fractures of larger bones as tibia and femur.

Disclosure: No significant relationships.

S004 Is There a Real Problem with Removal of Locking Screws After Locking Compression Plating of the Clavicle?

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Introduction: There are some reports on the difficulties of removing the locking compression plate in clavicle fractures, due to problems of removing the self tapping locking screws. We retrospectively investigated if this was also the case in our institution in removal of LCP plate of the clavicle and if this was incidental or becoming a trend.

Material and Methods: From October 2004 till October 2009, we have removed 30 locking compression plates after clavicle fracture stabilization. All of the locking screws were inserted by trauma surgeons with the use of the torque limiting screwdriver according to the manufacturer's recommendations. A total of 171 screws were removed. They consisted of fifty-one 3.5 mm self tapping cortical screws and hundred and twenty 3.5 mm self tapping locking screws.

Results: From the 30 locking compression plates that were removed after clavicle fracture stabilization, in eleven patients (37%) a problem with removal of the plate arose. This was caused by a total of 17 self tapping locking screws. In all 17 cases jamming of the screwheads in the plate was found to be the reason. There was "cold welding" between the threaded head of the locking screw and the locking plate. For removal four different strategies were used. In two screws the head was drilled off and the plate removed and subsequent the rest of the screw removed with forceps. Five times the plate was bent around the screw and by rotating the plate (helicopter) both were taken out. In eight screws the recess of the head of the screws were enlarged and a conical extraction screwbit 3.5 was used to remove the screws. Two times a combination of cutting the plate and helicopter technique was used successfully. In comparison the fifty-one 3.5 mm selftapping cortical screws were removed without any problem.

Conclusion: The locking compression plate is a useful attribute in fracture treatment of the clavicle. However in one-third of the patients removal of locking compression plates and especially the 3.5 mm self tapping locking screws from the clavicle, becomes an increasingly challenging procedure. We find this an unacceptably high percentage.

References: Ehlinger M et al. Technical difficulties in hardware removal in titanium compression plates with locking screws. *Orthop Traumatol Surg Res.*(2009) 95(5): 373-376 Bae J-H et al. Technical difficulties of removal of locking screw after locking compression plating. *Arch Orthop Trauma Surg.* (2009) 129: 91-95

Disclosure: No significant relationships.

S005 Clinical Relevance of High Resolution MRI for Acromioclavicular Joint Instability

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Introduction: In the clinical practice it is not possible to diagnose lesions of the intraarticular disc of the AC-Joint. Only in a small

number of mri studies it was possible to describe the intraarticular disc. Until now there was no in vivo verifying of one of these MRI protocols. The introduction of a high resolution MRI protocol using a superficial coil (3D WATS and T2FFE) that has been developed in an ex-vivo model allows the visualisation of the intra-articular structures. The aim of this study is to ascertain the significance of the mentioned MRI protocol and the applicability in the clinical practice in a limited patients cohort with instability of the AC-Joint. The MRI findings are compared to the arthroscopic findings.

Material and Methods: In a one year period 16 patients with chronic acromioclavicular-joint dislocation Rockwood Type II and III were seen in the outpatient clinic. The major symptom was pain followed by loss of power. Inclusion criteria were a history of more than three months the exclusion of subacromial pathologies, age over 18 and the indication for arthroscopic revision of the ac-joint. The radiological examiner was blinded to the clinical findings. The MRI-scan was performed on both sides. At the time of the operation the surgeon was blinded to the MRI reading. The surgical procedure was performed by arthroscopy in beach chair position. The surgical findings have been documented by video and also in a descriptive manner. The examination was performed on a 1.0 T MRI-system.

Results: Throughout the radiological examination, in 9/13 patients a rupture of the intra-articular disc was suspected. In 3/13 cases degenerative alterations were described. In one case the reading was negative (e.g. „no rupture of the intra-articular disc“). During the surgical examination 12/13 patients showed ruptures of the intra-articular disc. In one patient no signs of macroscopical disintegration of the disc could be detected. In the case with negative radiological reading, the disc was verified as intact during surgery. In all other cases the disc was disintegrated, including those with the radiological reading „alterations without clear signs of rupture“. The significance of the described MRI protocol was 75%.

Conclusion: The possibility to get more information about the intraarticular structures of the AC-Joint by the use of a promising preoperative diagnostic procedure like the MRI could help us in the understanding of the pathology beyond the instability.

References: 1. Fialka, C., Stampfl, P., Oberleitner, G., and Vecsei, V.: Traumatic acromioclavicular joint separations - current concepts. *European Surgery*. 36:20-24, 2004. 2. Heers G, Götz J, Schubert T, Schachner H, Neumaier U, Grifka J, Hedtmann A: MR imaging of the intraarticular disc of the acromioclavicular joint: a comparison with anatomical, histological and in vivo findings. *Skeletal Radiol*. 2007 Jan;36(1):23-8.

Disclosure: No significant relationships.

S006 Evaluation of the Clavicle Hook-plate for Treatment of Acromioclavicular Joint Dislocation: A Cadaver Study

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Introduction: The purposes of this study was to determine if an angle stable clavicle hook-plate causes subacromial bony or rotator cuff impingement and to evaluate if this is caused by surgical technique or characteristics of the implant in the treatment of acromioclavicular (AC) joint dislocation.

Material and Methods: A fresh-frozen cadaver torso was utilized. Open reduction and internal fixation of the AC joint was accomplished with the Synthes \hat{A} ® clavicle hook-plate in two positions. Afterwards dissection of the shoulder region was performed. Evaluations were performed with the shoulder in various glenohumeral positions to assess for subacromial bony or soft-tissue impingement.

Results: The dissection of the shoulder showed that there was no subacromial bony impingement of the hook-plate if placed in the correct position. The distance between the greater tuberosity and the hook-plate with 90° of shoulder forward flexion and with 90° of abduction was more than sufficient if the hook-plate was in the correct position. A more anterior placement of the hook-plate causes subacromial bony impingement.

Conclusion: This study demonstrated that the clavicle hook-plate can reduce the AC joint anatomically, does not cause bony impingement, and does not cause rotator cuff impingement if correctly positioned. A slightly more anterior position could be responsible for pain and impingement symptoms reported in patients after treatment with the angle-stable hook-plate.

References: Renger RJ, Roukema GR, Reurings JC, Raams PM, Font J, Verleisdonk EJ. The clavicle hook plate for Neer type II lateral clavicle fractures. *J Orthop Trauma*. 2009 Sep;23(8):570-4. Tambe AD, Motkur P, Qamar A, Drew S, Turner SM Fractures of the distal third of the clavicle treated by hook plating. *Int Orthop*. 2006 Feb;30(1):7-10. Epub 2005 Oct 19. Muramatsu K, Shigetomi M, Matsunaga T, Murata Y, Taguchi T. Use of the AO hook-plate for treatment of unstable fractures of the distal clavicle. *Arch Orthop Trauma Surg* (2007) 127:191-194.

Disclosure: No significant relationships.

S007 Outcomes of Management of Acute Acromioclavicular Joint Dislocation Using Tight Rope Device

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Introduction: To assess the safety, efficacy and outcome of treating grade III and above AC joint dislocations using Tight Rope device in young and active patients.

Material and Methods: Twenty patients who sustained grade III and above AC joint dislocations underwent Tight Rope fixation (Arthrex) of the AC joint were studied prospectively. The average age in the cohort was 38 yr with 13 dominant and 7 non-dominant arms affected. Seventeen patients sustained grade III AC joint dislocation and three sustained lateral end clavicle fracture.

All patients were operated by a single surgeon (PDS). A 1.5 cm bony strap incision is made about 2 cm medial to the AC joint. After drilling a 4 mm hole with a cannulated drill through the clavicle and coracoid a Tight Rope is inserted, the clavicle is reduced and stabilized with the implant. Reduction of AC joint is confirmed using fluoroscopy. All patients followed a standardized rehabilitation program and early physiotherapy. Patients were followed up at 6 weeks, 3 months and 6 months following surgery.

Results: The average Oxford shoulder score at 6 months following surgery was 52 (range 40-59), with restoration of near normal shoulder range of movements. All patients returned to their original occupation at average 8 weeks. One patient had failure of fixation which required revision surgery using hook plate fixation.

Conclusion: Tight Rope fixation offers a safe, effective and more anatomical fixation for AC joint dislocation and displaced lateral end clavicle fractures in young and active patients without the need for metal work removal.

Disclosure: No significant relationships.

OBSTRUCTION

S008 Abbreviated Emergency Laparotomy in the Non-trauma Setting

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Introduction: Although the application of damage control surgery for trauma has been widely reported and defined, similar approach in non-trauma patients has not been well detailed.

Material and Methods: Study design: A retrospective analysis of data from non-trauma patients who underwent emergency laparotomy between May 2006 and December 2008. Demographics, indications for surgery and outcome of patients who had definitive laparotomies (DL) and patients who had damage control laparotomies (DCL) were compared. Appendectomies were excluded.

Results: Two-hundred ninety-one patients (55% males) were included. Thirty-one (10.7%) underwent DCL (58% males). Mean age of patients who had DL and DCL was 65 and 62.8 years respectively. Peritonitis and mesenteric ischemia were more common indications in patients with DCL than DL: 48.4% vs. 30.4% ($p = 0.04$) and 32.3% vs. 3.5% ($p < 0.0001$) respectively. Twenty-nine percent of patients who had DCL were hemodynamically unstable. Mortality rates were 54.8% and 16.5% in patients with DCL and DL respectively ($p < 0.0001$). Patients who died after DCL and DL were significantly older than patients who survived (75 vs. 47.3 and 74 vs. 63 years respectively, $p < 0.0001$). Median hospital stay was 21 and 9 days for patients with DCL and DL respectively ($p < 0.05$). Patients who underwent DCL had significantly more wound infections, sepsis and multi-organ failure.

Conclusion: The philosophy of damage control surgery may be applied to non-trauma patients as some of the prerequisites for the decision to elect this strategy are the same. Metabolic disturbances, hemodynamic instability and peritonitis are the most common indications for damage control surgery in non-trauma patients.

Disclosure: No significant relationships.

S009 Acute Obstructing Colon Cancer: Characteristics and Prognosis

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Introduction: Cancer of the colon is a common disease. The choice of treatment after diagnosis is surgery, in an elective setting, to remove the tumor. However, a large number of patients present with colonic obstruction requiring acute surgery before the diagnosis is known, or before the set date for elective surgery. Previous studies have shown

a worse outcome for patients who undergo surgery in the acute setting compared to patients in scheduled care. The aim was to establish characteristics and prognosis in patients with acute obstructing colon cancer compared to patients who underwent elective colon cancer surgery.

Material and Methods: All patients diagnosed with colon cancer during 2000-06 in the Linköping area were identified through the Swedish colorectal cancer register ($n = 438$). A retrospective analysis of patients with colonic obstruction ($n = 88$) was done using various criteria from the medical records. Exclusion criteria were acute surgery due to reason other than obstruction ($n = 57$), non-surgical treatment ($n = 44$), other diagnosis ($n = 13$), or missing medical records ($n = 11$).

Results: 88 patients underwent surgery for acute colonic obstruction (a.c.o.) and 225 patients had an elective operation (e.o.). The median age was 74 years in a.c.o. and 76.5 in e.o. There were 55% men and 45% women in the a.c.o. and 42% men and 58% women in the e.o. groups respectively. The preoperative ASA score was similar in a.c.o. and e.o. groups. TNM-stage for a.c.o. and e.o. were: stage I 1% vs. 20%, stage II 30% vs. 38%, stage III 34% vs. 29%, stage IV 35% vs. 12%. Postoperative mortality (within 30 days) was 9% in the a.c.o. and 2% in the e.o. groups. Surgical complications were diagnosed in 16% after a.c.o. and in 14% after e.o. Other postoperative complications occurred in 19% in a.c.o. and in 13% in e.o. groups. The overall 2-year survival was 50% in a.c.o. and 79% in e.o. groups respectively. When sub-grouped according to tumor-stage, the 2-year survival was; stage I: 100% in a.c.o. and 91% in e.o.; stage II: 70% in a.c.o. and 88% in e.o.; stage III: 70% in a.c.o. and 74% in e.o.; stage IV: 13% in a.c.o. and 39% in e.o.

Conclusion: Acute surgery due to colonic obstruction of colon cancer is common. Tumor stage seems to be more advanced in patients with obstructing disease than in patients scheduled for elective surgery and consequently the rate of complications is higher and the outcome is worse. However, when stratified for different TNM-stages, the worse outcome in 2-year survival for patients with acute obstructing colonic cancer still remains. The explanation for this difference is to be elucidated in further studies.

Disclosure: No significant relationships.

S010 Preoperative Colonic Stenting Versus One Stage Surgery in Colonic Occlusion

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Introduction: Acute colonic obstruction due to malignancies is often a surgical emergency. Hartmann's procedures or one stage-resection with primary anastomosis (with or without ileostomy) have been the treatment of choice. However these procedures are associated with a significant morbidity and mortality rate. Self expanding metallic stents (SEMS) have shown their efficiency as palliative treatment in colonic cancer. Colonic stenting has been advocated as a "bridge" towards surgical procedures in potentially resectable diseases. The aim of this study is to evaluate the efficacy of colonic stenting in the emergency treatment of large bowel occlusion either for palliation or to enable to planned surgical procedure.

Material and Methods: From January 2004 to July 2009, 103 patients were enrolled into the study. Group A: 50 patients (pts) (mean age 69 y/o) who underwent standard surgical procedures and 53 pts.- mean age 72- who underwent stenting. In this group 15 patients were not eligible for surgery and thus stenting was the palliative treatment of the disease; in 38 pts (group B) a planned delayed surgery was carried out. Age, gender, body mass index (BMI), comorbidities, surgical procedure, ASA score, transfusions, morbidity and mortality have been recorded.

Results: Group A and group B were similar in age, gender, BMI and comorbidities. About stenting placement no perforative complication has been observed, 7.5% of patients reported anal pain, 5.6% had self-limiting local bleeding, in 7.5% there was stent migration and in 3.7% failure of stent placement which was attributed to stent obstruction. A trend to a better outcome seems to be observed in stenting placement compared to emergency surgery: transfusion 38% in gr.A and 26.3% in gr.B, anastomotic leakage 18.8%(A) vs 7.6%(B), surgical site infection 54% (A) vs 23.6%(B) cardio-pulmonary complications 38% (A) vs. 18.4%(B).

Conclusion: This study seems to suggest that insertion of SEMS is efficient in the treatment of colonic occlusion allowing a planned surgery. Preoperative stenting is associated with improved primary anastomotic rates and fewer post operative complications.

References: 1) Baque P, Chevalier P Karimjee Solihi et al. Colostomy vs self expanding metallic stents: comparison of the two techniques in acute tumoral left colon obstruction. *Ann Chir* 2004;129:353-358 2) Olmi S, Scaini A, Cesana G, Dinelli M, et al. Acute colonic obstruction: endoscopic stenting and laparoscopic resection. *Surg Endosc* 2007;21:2100-2104 3) Martinez-Santos C, Lobato RF, José Manuel Fradejas JM et al. Self-Expandable Stent Before Elective Surgery vs. Emergency surgery for the treatment of malignant colorectal obstructions: comparison of primary anastomosis and morbidity rates. *Dis Colon Rectum* 2002;45:401-406 4) Khot UP et al., Systematic review of the efficacy and safety of colorectal stents. *Br J Surg* 2002;89:1096-1102.

Disclosure: No significant relationships.

S011 Small Bowel Obstruction due to Intestinal Adhesions

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Introduction: To evaluate the results of the treatment of patients with the small bowel obstruction due to intestinal adhesions.

Material and Methods: Medical records for the patients treated with small bowel obstruction due to adhesions from 1995 to 2005 were reviewed. The patient's age, gender, previous abdominal operations, method of the treatment and outcomes were analyzed.

Results: There were 1594 patients admitted to the Vilnius University Emergency Hospital during 10 years period. Appendectomy as a previous operation was recorded in 40% of cases. Surgery was required in 457 of the cases (28.7%). Strangulated small bowel was found in 197 patients (43.1%). In 404 cases (88.4%) the surgical procedure was limited to adhesiolysis, whereas in 53 cases (11.6%) an intestinal resection was performed. Enterodecompression tube was used in 156 cases (34.1%). The operative mortality was 4.8% (22

cases). Mortality after the treatment due to strangulation was 3.9% (18 cases).

Conclusion: There were 29% of surgically treated patients. Main reasons of adhesions formation was previous performed appendectomy and midline lower laparotomy. The criteria of ineffective conservative treatment were absent of the positive results of the physical, laboratory, radiological and ultrasound examination. Mortality after the strangulated small bowel resection was higher. Operative enterodecompression reduces the risk of the postoperative complications and mortality.

Disclosure: No significant relationships.

S012 Prospective Controlled Randomized Trial on Prevention of Postoperative Abdominal Adhesions by Icodextrin 4% Solution After Laparotomic Operation for Small Bowel Obstruction Caused by Adhesions

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Introduction: Adhesive small intestine occlusion (ASIO) is an important cause of hospital admission and are associated with significant morbidity and mortality, placing a substantial burden on healthcare systems worldwide. Icodextrin 4% solution is a high-molecular-weight α-1,4 glucose polymer that is approved in Europe for use as an intra-operative lavage and a post-operative instillate to reduce the occurrence of post-surgery intra-abdominal adhesions. The current clinical study evaluates the safety and effectiveness of icodextrin 4% for decreasing the incidence, extent, and severity of adhesions in patients after abdominal surgery for ASIO.

Material and Methods: The study project is a prospective, randomized controlled investigation. The safety and efficacy of icodextrin 4% is compared to no antiadhesion treatment (control) in a parallel group, prospective, randomized study with a blinded evaluation of efficacy end points. Subjects with ASIO and surgical indication to laparotomy are enrolled and randomized. Patients are submitted to adhesiolysis with bowel resection if necessary with or without anastomosis. The first group receives traditional treatment (control group) whereas the second group is treated with icodextrin 4% before abdomen closure.

Results: 91 patients were randomized to have icodextrin 4% solution and 90 patients to have traditional treatment. The recurrence rate was 2.1% in the icodextrin groups vs 11.1% after a mean period of 31.2 months (p < 0.05). No complications icodextrin-related were found.

Conclusion: These data showed that the use of icodextrin 4% solution in ASIO is safe and can reduce the risk of re-obstruction. A Trial supported by the World Society of Emergency Surgery.

References: Trials. 2008 Dec 18;9:74.

Prospective controlled randomized trial on prevention of postoperative abdominal adhesions by Icodextrin 4% solution after laparotomic operation for small bowel obstruction caused by adhesions [POPA study: Prevention of Postoperative Adhesions on behalf of the World Society of Emergency Surgery].

Catena F, Ansaloni L, Lauro A, Ercolani G, D'Alessandro L, Pinna A.

Disclosure: No significant relationships.

S013 Is it Safe to Perform Resection and Primary Anastomosis in Perforation of the Left Colon in an Emergency Setting?

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Introduction: Hartmann operation has been the Standard for the treatment of left colon perforations in the emergency surgery. This implies that in most of the cases, a second operation should be done to perform reconstructive surgery. We report on a series of left colon resection with primary anastomosis in the emergency setting in Torrevieja Hospital.

Material and Methods: Over a period of 18 months (March 2008 through September 2009), 32 cases of left colon perforation were done for different causes. All the operations were done by two surgeons of the same surgical team. The operations consisted on left colon resection with primary anastomosis without intraoperative mechanical irrigation nor protective ileostomy nor colostomy.

Results: None of the patients included in the study presented with complications related to the anastomosis (no leakage nor dehiscence). All patients were discharged before ten days.

Conclusion: Left colon resection with primary anastomosis for certain patients with left colon perforation is safe and feasible, with good results. It is marked with lower economic cost insofar as a second reconstructive operation is no longer needed.

References: Operative management of diverticular emergencies: strategies and outcomes. Schwesinger WH, Page CP, Gaskill HV 3rd, Steward RM, Chopra S, Strodel WE, Sirinek KR. Arch Surg. 2000 May;135(5):558-62; discussion 562-3. Primary resection and anastomosis for perforated left colon lesions. Umbach TW, Dorazio RA. Am Surg. 1999 Oct;65(10):931-3. Treatment of left-sided colonic emergencies: a comparison of US and UK surgical practices. Engledow AH, Bond-Smith G, Motson RW, Jenkinson A. Colorectal Dis. 2009 Jul;11(6):642-7. Epub 2008 Jul 15. Comparative study to determine the need for intraoperative colonic irrigation for primary anastomosis in left-sided colonic emergencies. Ortiz H, Biondo S, Ciga MA, Kreisler E, Oteiza F, Fracalvieri D. Colorectal Dis. 2009 Jul;11(6):648-52. Epub 2008 Jul 4. Emergency left colon resection for acute perforation: primary anastomosis or Hartmann's procedure? A case-matched control study. Breitenstein S, Kraus A, Hahnloser D, Decurtins M, Clavien PA, Demartines N. World J Surg. 2007 Nov;31(11):2117-24. Epub 2007 Aug 24. Safety of bowel resection for colorectal surgical emergency in the elderly. Pavlidis TE, Marakis G, Ballas K, Rafailidis S, Psarras K, Pissas D, Papanicolaou K, Sakantamis A. Colorectal Dis. 2006 Oct;8(8):657-62. Emergency operations for nondiverticular perforation of the left colon. Biondo S, Parés D, Martí Ragué J, De Oca J, Toral D, Borobia FG, Jaurrieta E. Am J Surg. 2002 Mar;183(3):256-60.

Disclosure: No significant relationships.

S014 Generalized Peritonitis due to Perforated Diverticulitis: Hartmann Procedure or Primary Anastomosis?

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Introduction: Hartmann's procedure (HP) still remains the most frequent performed procedure in diffuse peritonitis due to perforated diverticulitis.¹⁻³ Nevertheless it is associated with high morbidity and mortality.¹ The aim of this study was to assess feasibility, morbidity and mortality of resection with primary anastomosis (PA) with or without diverting loop ileostomy versus HP in case of diverticular peritonitis.^{2,3}

Material and Methods: We retrospectively reviewed our prospectively collected database from 1/95 to 12/08 of patients who were operated in the emergency department of Bellvitge University Hospital. Only patients operated on generalized diverticular peritonitis (Hinchey III-IV) were included. Data on patients' demographics, ASA classification, Hinchey score, Peritonitis Severity Score (PSS), surgical procedure, post-operative morbidity, mortality and post-operative hospital stay were studied.

Results: A total of 87 patients [median age 66 (34-94) years], female 39.1% were included. Sixty (69%) had undergone HP and 27 (31%) PA. Only in 5 patients (5.7%) a diverting ileostomy was performed. Overall post-operative morbidity was 74.7%, most frequent complications were wound infection 33.3%, respiratory complications 20.7% and sepsis 17.2%. Overall mortality was 33.3% (29 pt). These patients had a mean PSS of 11.1 while the survival group 8.6. There was an overall reintervention rate of 17.2%, after PA 11.1% and after HP 20.0%. Significant differences were found in the HP versus PA group in ASA score (ASA I-II: 20% v 81%, ASA III-IV: 80% v 18%) and the median PSS (11 versus 8). 62% (21/34 pt) with PSS ≤ 8 underwent PA, but none (0/31) with PSS ≥ 11. The post-operative morbidity was significantly higher for HP (86.2%) compared to PA (48.1%). Focusing on hospital stay there was a significant difference between PA (mean 15.1 days) versus HP (mean 27.9 days). In the stratified analysis considering patients with Hinchey III peritonitis we found a mortality of 45.7% (21/46 pt) in the HP group versus 7.7% (2/26 pt) of the PA group. The mortality rate stratified for ASA and surgical procedure shows no difference in ASA I-II, but in ASA III-IV a lower postoperative mortality for HP (20.2%) versus PA (40.0%). Including only patients with PSS less than 11 (56 patients) there is a significantly lower morbidity in PA (80.1%) versus HP (89.7%).

Conclusion: Our data show that PA can be performed safely with lower morbidity and mortality for diverticular peritonitis in patients with ASA I-II, Hinchey III peritonitis grade or PSS less than 11 respectively to HP. These findings are supported by a shorter hospital stay in favor to PA.

References:

1. Vermeulen J, et al. Colorectal Dis. 2009 Jul;11(6):619-24. 2. Biondo S, et al. Br J Surg. 2006 May;93(5):616-22. 3. Zingg U, et al. Colorectal Dis. 2008 Oct 1. Epub

Disclosure: No significant relationships.

S015 Emergency Abdominal Surgery in Elderly Patients: Risk Factors for Prognosis

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Introduction: Management of elderly patients requiring emergent abdominal surgery is complex due to often seen co-morbid diseases.

Material and Methods: Effects of age, sex, co-morbid disease, diagnosis, laboratory values, and type of surgery on complications, postoperative stay, and mortality in 39 consecutive patients older than 60 years of age who underwent emergent abdominal surgery in a 30-months' period in a university hospital were analysed.

Results: Mean age was 74.5 years. M/F ratio was 13/26. Main causes were biliary system disease (30,8%), intestinal obstruction/perforation (38,5%), GI bleeding (12,8%), and acute appendicitis (12,8%). 59% had at least one co-existing disease. Median ASA score was 3. Median postoperative stay was 11,5 days. Complication and mortality rates were 56% and 20,5%. Mean hsCRP at admission was higher in patients who died ($p = 0,007$). Other laboratory values including WBC were similar in patients who died and who survived. Mortality was significantly higher in patients with co-morbid diseases ($p = 0,002$). Among co-morbid diseases, chronic hemodialysis ($n:7$) significantly effected mortality ($p = 0,0001$). Being in the ICU at presentation (28%) significantly effected mortality ($p = 0,02$). Mortality rates were similar between different types of diseases or organs operated. Overall, ASA score demonstrated a trend effect on mortality ($p = 0,05$), and especially patients with ASA score III or IV had significantly higher mortality rates ($p = 0,0001$). Rate of complications correlated significantly with age ≥ 65 yrs ($n:32$) ($r_s = 0,39$, $p = 0,016$). Age ≥ 75 yrs ($n:21$) significantly correlated with complications ($r_s = 0,33$, $p = 0,04$) and postoperative stay ($r_s = 0,38$, $p = 0,02$).

Conclusion: Age itself is not a determinant factor on mortality in elderly patients; however, it may increase complication rates. Mortality is increased mainly due to co-morbid illnesses. Chronic hemodialysis and admission to ICU are poor prognostic factors. Elderly patients should not be abandoned of having emergency abdominal surgery just because of their ages.

Disclosure: No significant relationships.

NAILING

S016 A New Radiation Free Targeting Device. Preliminary Results

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Introduction: One of the most demanding steps of intramedullary nailing is the distal locking. Most of young surgeon are "affraid" to treat a long bone fracture by a nail because of the distal locking. The aim of this study is to evaluate a new friendly radiation free targeting device on cadavers.

Material and Methods: The study was conducted on fixed cadavers. 25 femurs were available. The method consists of the following steps: determining the zero position of the device; opening the tip of the great trochanter; introducing the nail (Sirus nail® 12X400 (Zimmer

Inc.)); introducing an emitter inside the nail to be positioned in the distal holes; adaptation of the guide on the standard handle with a receptor; moving the receptor to be aligned to the emitter; changing the receptor for the sleeve and performing the drilling and the locking. For the second or even third screw, the targeting device needs a little adjustment.

Results: On the 25 distal locking procedures (50 screws), we observed only one failure due to the breakage of the prototype. This translates as a 98% success rate for two screws with a mean time of 8.2 min. Two surgeons conduct this study. Not only the inventor but also a inexperienced surgeon tested the new device with the same success.

Conclusion: This new device has the advantage to be fully mechanical, to be solidly linked to the patient and to be totally radiation free. It can be used in any hospital, by any surgeon. The procedure is easy to learn and reproducible. It could be adapted to any nail system and does not need external power supply.

References: Arlettaz Y, Akiki A, Chevalley F, Leyvraz PF. Targeting device for intramedullary nails: a new high-stable mechanical guide. *Injury*. 2008 Feb;39(2):170-5. Epub 2007 Sep 19.

Disclosure: No significant relationships.

S017 Anterior Knee Pain After Tibial Intramedullary Nailing. Why?

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Introduction: Anterior knee pain (AKP) is common complication following intramedullary nailing of tibial shaft fracture.

Material and Methods: We evaluated postoperative outcome results of 50 patients, operated in last 3 years, with healed fractures initially treated with intramedullary reamed nails with 2 or 3 interlocking screws on both parts of nail and with use of medial paratendinous incision for nail entry portal. Our aim was to analyze possible relationship between AKP according to the VAS scale, and nail position marked as a distance from tip of nail to tibial plateau (NP) and to tuberositas tibiae (NT), measured postoperatively on L-L knee X-rays.

Results: Two groups of patients were formed on the basis of presence of pain related to AKP (the level of pain was neglected): with pain - Group A and without pain - Group B. The difference between two groups concerning NP and NT measurements appeared and it was statistically significant concerning NT measurement ($p < 0,05$), with high accuracy according to the Classification tree.

Conclusion: We presume that a position of a proximal tip of the nail and its negative influence on the innervation pattern of the area dorsal to patellar tendon could be the key factor of AKP. We conclude that the symptoms of AKP will not appear if a tip of the nail position shall be more than 6,0 mm from tibial plateau (NP) and more than 2,6 mm from tuberositas tibiae (NT).

References: 1.Vaisto O, Toivanen J, Kannus P, Jarvinen M. Anterior knee pain and thigh muscle strength after intramedullary nailing of

tibial shaft fractures: a report of 40 consecutive cases. *J Orthop Trauma*, 2004 Jan; 18 (1): 18-23 2. Bhattacharyya T, Seng K, Nassif NA, Freedman I. Knee pain after tibial nailing: the role of prominence. *Clin Orthop Relat Res*, 2006 Aug; 449:303-7 3. Court-Brown CM, Gustilo T, Shaw AD. Knee pain after intramedullary nailing: its incidence, etiology, and outcome. *J Ortho Trauma*. 1997 Feb-Mar; 11(2): 103-5. 4. Toivanen JA, Vaisto O, Kannus P, Latvala K, Honkonen SE, Jarvinen MJ. Anterior knee pain after intramedullary nailing in fractures of the tibial shaft. A prospective, randomized study comparing two different nail-insertion techniques. *J Bone Joint Surg Am*. 2002 Apr; 84-A(4): 580-5 5. Vaisto O, Toivanen J, Paakkala T, Jarvela T, Kannus P, Jarvinen M. Anterior knee pain after intramedullary nailing of tibial shaft fracture: an ultrasound study of the patellar tendons of 36 patients. *J Ortho Trauma*, 2005 May-Jun; 19(5):311-6 6. Keating JF, Orfay R, O'Brien PJ. Knee pain after tibial nailing. *J Ortho Trauma*, 1997 Jan; 11(1): 10-3 7. Yu SW, Tu YK, Fan KF, Su JY. Anterior knee pain after intramedullary tibial nailing. *Changcheng Yi Xue Za Zhi*, 1999 Dec; 22(4):604-6.

Disclosure: No significant relationships.

S018 Anterior Knee Pain After T2 Intramedullary Nailing of Tibial Fracture: An International Multicenter Prospective Clinical Study

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Introduction: Anterior knee pain is one of the most frequent complication of tibial nailing. Its aetiology remains unclear, potentially being a multifactorial event. The aim of this prospective study was to evaluate if anterior knee pain has any negative influence on: bone healing (the hypothesis is if the patient has anterior knee pain he or she will not put weight on the affected leg and this will not stimulate the bone healing), ability to return to work and quality of life.

Material and Methods: 3 European level 1 trauma center was involved in this study. Methods: between January 2003 and December 2004, 102 patients with a tibia fracture was admitted to the trauma departments. We used a standard T2 tibia nail (Stryker) with the possibility of proximal and distal fixation with 3 screws. The approach was trans or parapatellar.

Results: At 4-6 weeks, 4 months, 12 months follow-up we had 11, 13, 14 patients with anterior knee pain. The VAS decreased from 3,1 to 2,3, bone healing was 100% and for 70% of patients it was possible to do their previous full time job after 12 months. The quality of life (walking up and down stairs normally without any help, putting on shoes and socks, sitting/standing from a chair, total weight bearing,) was improving.

Conclusion: We conclude that anterior knee pain in this study is mild, that the two different methods of patellar tendon approach (trans or paratendinous approach) have no relevance and it does not have a negative influence on bone healing, ability to return to work and the quality of life.

References: 1 Court-Brown CM, Gustilo T, Shaw AD. Knee pain after intramedullary tibial nailing: Its incidence, etiology, and outcome. *J Orthop Trauma*. 1997;11:103-105. 2 Keating JF, Orfay R, O'Brien PJ. Knee pain after tibial nailing. *J Orthop Trauma*. 1997;11:10-13. 3 Orfay R, Keating JE, O'Brien PJ. Knee pain after tibial

nailing: does entry point matter? *J Bone Joint Surg Br* 1995;77 :976-977 4 Toivanen JAK, Väistö O, Kannus P, et al. Anterior knee pain after intramedullary nailing of fractures of the tibial shaft. *J Bone Joint Surg Am* 2002;84:580-585. 5 Karladani HA, Styf J. Percutaneous intramedullary nailing of tibial shaft fractures: a new approach for prevention of anterior knee pain. *Injury*. 2001;9:736-739.

Disclosure: No significant relationships.

S019 The T2 Intramedullary Compression Tibia Nailing: Comparison of Fracture Table and Manual Traction, a Prospective Multicenter Clinical Study

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Introduction: The aim of this study was to see if there is any difference between manual traction and fracture table regarding: operation time, fluoroscopy time, bloodloss, complications and functional results.

Material and Methods: Three European level 1 Traumacentres was involved in this study. between January 2003 and December 2004, 102 patients with tibia fracture were treated with a reamed T2 nail. 48% of patients without traction and 18% patients with traction. in 34% patients this result was missing. the follow up was 4 to 6 weeks, 4 and 12 months.

Results: Peroperative results: P value for fluoroscopy time (traction versus no traction) $p = 0,068$. P value for operation time (traction versus no traction) $p < 0,001$. P value for bloodloss (traction versus no traction) $p < 0,001$. P value for tourniquet (traction versus no traction) $p < 0,001$. functional results Bone healing (4-6 weeks/4/12 months) in patients without traction and with traction. 4-6 weeks: $p = 0,005$. 4 months: $p = 0,562$. 12 months: $p = N/A$ (constant) Deviation (axial/rotational) of legs in patients without and with traction. 4-6 weeks: $p = 1,000$. 4 months: $p = 0,289$. 12 months: $p = 0,604$. Leg length difference in patients without and with traction 4-6 weeks: $p = 0,497$. 4 months $p = 1,000$. 12 months $p = 0,486$. Full weight bearing in patients without and with traction. 4-6 weeks $p = 0,384$. 4 months $p = 0,277$. 12 months $p = N/A$ (constant). Returning to full time work in patients without and with traction. 4-6 weeks $p < 0,001$. 4 months $p < 0,001$. 12 months $p = 0,133$. complications as infection, heterotopic bone, neurodystrophy and foot pain are more seen in patients without traction. complications as patella pain and compartment syndrome are more seen in patients with traction

Conclusion: Patients without traction had significantly shorter operation time, less bloodloss and longer fluoroscopy time. in this group of patients there was also significantly more use of tourniquet. there are no significant difference in functional results in both groups, except for the patients in returning to full time work after 4-6 weeks and 4 months ($p < 0,001$) patients with traction had more patella pain and those without traction had more foot pain.

References: Femoral intramedullary nailing: comparison of fracture-table and manual traction. D.J.G. Stephen et al. *J Bone Joint Surg* 2002;84:1514-21.

Disclosure: No significant relationships.

S020 Intramedullary Nailing Without Interlocking for Femoral and Tibial Shaft Fractures

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Introduction: Intramedullary fixation is the treatment of choice for diaphyseal fractures of the femur and tibia. In our institution fractures with axial and rotational stability are treated with intramedullary nailing without interlocking. We evaluate our current clinical experience with this type of fixation.

Material and Methods: In this study, patients presented in the University Medical Center Utrecht, a level-1 trauma center, from October 2003- July 2009 with acute traumatic axial and rotational stable diaphyseal shaft fractures of the tibia or femur were included. They underwent internal fixation using unreamed intramedullary nails without interlocking. Patient records were evaluated for operating time, perioperative complications and healing time. Absence of localized tenderness and pain during walking were considered as clinical criteria for union, radiographic criteria of union being continuity in at least in three cortices in both AP and lateral views.

Results: Twenty-eight long bone fractures were treated in 26 patients: 20 men and 6 women, with an average age of 27,9 years (range 15.6-54.4). There were 12 femoral fractures (AO classification: 10 type A1-3 and 2 B2) and 16 tibial fractures (AO classification: 14 type A1-3 and 2 B2). Of these 28 fractures, 16 were closed and 9 were open (6 Gustilo-Anderson 1, 3 Gustilo-Anderson 2). The mean operating time was 45 min (range 18-68 min) for tibial fractures and 55 min (range 47-150 min) for femoral fractures. Postoperative complications occurred in seven patients: four developed a compartment syndrome requiring fasciotomy, two developed pneumonia and one developed respiratory distress due to fat embolism. Two patients (three fractures) were lost to follow up. Healing occurred in 24 of the 25 fractures (96%) without additional interventions. There was one tibial delayed union and one non-union. One tibia was converted to a standard locked nail because of axial and rotational instability after mobilization and weight-bearing was started.

Conclusion: According to our results, the use of unreamed intramedullary nailing without interlocking, where indicated, is associated with minimal complications and good functional outcomes in fractures AO types A and B. The advantages include the decrease in the operating time and the simplicity of its application.

Disclosure: No significant relationships.

S021 Management of Supracondylar – Intracondylar Femoral Fractures with Retrograde Intramedullary Nailing

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Introduction: The aim of this study is to evaluate the results of the use of retrograde nailing in the management of supracondylar - intracondylar femoral fractures.

Material and Methods: Between 2000 and 2009, 31 patients with supracondylar - intracondylar femoral fractures were treated with retrograde intramedullary nailing. 14 were men and 17 were women. The average age was 51,8 (18-97) years old. Four different types of nails were used. Parameters that were studied were: operative technique, time of union, range of motion. Mobilization of the patients started on the 2nd post-operative day.

Results: Follow up ranged from 6 months to 9 years. One patient was lost at the follow up (age 97). In 21 patients closed surgical technique and in 10 mini-open reduction was performed. All fractures healed. The average union time was 3,8 months. The range of motion patients gained was on average 120° (95°-135°) flexion and full extension. There was no case of infection, pseudarthrosis or neuro-vascular damage. In one patient a distal screw had to be removed because of iliotibial band impingement.

Conclusion: Retrograde intramedullary nailing in the management of supracondylar - intracondylar femoral fractures appears to be a safe and effective method of treatment, which gives the necessary stability and provides early mobilization of the patient. The method can be used in osteoporotic patients and in fractures with severe comminution.

Disclosure: No significant relationships.

S022 Six-Year Result of the Use of a Hydraulic Lengthening Nail for Post-Traumatic Lengthening. Review of 63 Cases

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Introduction: In period between 2003 and 2009, 63 lengthening nails were used for post-traumatic lengthening of the femur and tibia. The present study represents a learning curve in using this technique with the sequential development of three modifications of the initial design.

Material and Methods: The hydraulic lengthening nail (HLN) is activated by a hydraulic system and two-one way check valves, preventing collapse of the distraction. As a liquid sterile refined arachis oil was used in 55 cases and sterile saline in the rest. Daily distraction

was applied in one step. Twenty-seven femurs and thirty-three tibias were treated. The mean distraction rate was 1.6 mm (range 0.8-1.8 mm) for the femur and 1.3 mm (range 1.25-1.3 mm) for the tibia. The necessary pressure to advance the distraction in the tibia was average of 27 Bar (range 20 – 42 Bar), to distract the femur, 46 Bar (range 28 – 82 Bar).

Results: Bone healing index for tibia 1.1 and femur 0.7 months/cm distraction. Implant failure five cases; Infections three cases. Non-union of the distraction site or docking site four cases.

We did not encounter major stiffness of the adjacent joints.

Conclusion: Although the presented technique is a semi-closed distraction procedure, we find this system appealing because of its simplicity in use, low cost and the ability to immediate weight bearing.

References: Codvilla A., On the means of lengthening in the lower limbs. *Am.J.Orthop.Surg.*, V2(1905).pp.353-369 Paley D., Problems, obstacles and complications of limb lengthening by the Ilizarov technique. *Clin Orthop* (1990) 250:81-104.

Disclosure: No significant relationships.

S023 Intramedullar Cable Bone Transport with the Ilizarov Ring Fixator. A New Technique

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Introduction: Bone transport for treatment of segmental bone defects as a salvage procedure is related to a high complication rate. Post-traumatic soft tissue problems and callus insufficiency are to be dealt with especially in posttraumatic conditions. The Ilizarov Ringfixator allows a stable external bone fixation enabling full weight bearing. In bone defect reconstruction bone transport is commonly used. A major problem is the skin cutting wires for bone fixation. A new method of the cable transport with intramedullary cable passing avoids skin cutting thus reducing skin problems.

Material and Methods: 15 Patients with a metaphyseal and diaphyseal bone defect of the tibia after open trauma and posttraumatic infection were treated with debridement, bone resection and soft tissue coverage by local and free flaps. After soft tissue healing the monolateral external fixation was replaced in each patient by a four ring ilizarov fixator with a proximal percutaneous tibia osteotomy. For bone transport a flexible cable was placed around the distal part of the segment and passed intramedullarily through the distal segment out of the tibia and onto the Ilizarov fixator and the transport clickers. The bone segment was transported after a delay of 7 days anterograd by the intramedullary placed cable one mm per day.

Results: In all patients the bone defect was closed by the bone transport. In one patient early consolidation of the regenerate occurred and a rupture of the cable. Two patients had an insufficiency of the callus. The distal docking site was augmented in all patients after the segment transport with iliac bone graft for consolidation. The one patient with early consolidation was treated by a second osteotomy; the two patients with insufficiency were augmented during the docking operation with iliac bone graft.

Conclusion: The intramedullary cable transport is a new modification of the bone transport with the ilizarov ringfixator. The main advantage is the soft tissue sparing and protecting transport mechanism

enabling bone transports after free flap soft tissue coverage with micro vascular anastomosis.

Disclosure: No significant relationships.

INFECTION

S024 Surgical Site Infections in Orthopaedic Trauma

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Introduction: Orthopedic surgical-site infections prolong total hospital stays, double re-hospitalization rates, and increase healthcare costs. In addition, patients with orthopedic surgical-site infections have substantially greater physical limitations and significant reductions in their health-related quality of life. The purpose of this study is to determine the risk factors for surgical-site infections in patients with orthopaedic trauma undergoing surgery.

Material and Methods: A retrospectively reviewed prospective trauma database and billing records was used to identify all patients that received operative treatment between 2006 and 2008. Seventeen-hundred-and-eighty-three procedures in 1611 patients satisfied the inclusion and exclusion criteria. The medical record were reviewed and demographics and surgery specific data and whether or not the patients had a SSI was recorded. Significant variables in bivariate analysis were tested by multivariable analysis to derive predicted probabilities of SSI.

Results: Multivariable logistic regression analysis found six independent predictors of surgical site infection: 1) The use of a drain (odds ratio 2.2, p = 0.003); 2) Number of operations (odds ratio 3.5,

Conclusion: This analysis identified the use of a drain, number of operations, CHF, diabetes, and site of injury as independent predictors of surgical site infection after operative fracture treatment. These risk factors seem to reflect patient infirmity and injury severity, rather than factors amenable to intervention.

References: 1.Centers for Disease Control and Prevention, National Center for Health Statistics. Vital and Health Statistics, Detailed Diagnoses and Procedures, National Hospital Discharge Survey 1994. Hyattsville, Maryland: DHHS Publication 1997. 2.Jarvis WR. Selected aspects of the socioeconomic impact of nosocomial infections: morbidity, mortality, cost, and prevention. *Infect Control Hosp Epidemiol.* 1996;17(8):552-7. 3.Haley RW, Culver DH, White JW, Morgan WM, Emori TG. The nationwide nosocomial infection rate. A new need for vital statistics. *Am J Epidemiol.* 1985;121(2):159-67. 4.Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. CDC definitions of

- nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. *Infect Control Hosp Epidemiol*. 1992;13(10):606-8. 5. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee. *Infect Control Hosp Epidemiol*. 1999;20(4):250-78; quiz 79-80. 6. Whitehouse JD, Friedman ND, Kirkland KB, Richardson WJ, Sexton DJ. The Impact of Surgical Site Infections Following Orthopedic Surgery at a Community Hospital and a University Hospital: Adverse Quality of Life, Excess Length of Stay, and Extra Cost. *Infection Control and Hospital Epidemiology*. 2002;23(4):183-9. 7. Boer ASd, Groot AJMd, Severijnen AJ, Berg JMJvd, Pelt Wv. Risk Assessment for Surgical Site Infections in Orthopedic Patients. *Infection Control and Hospital Epidemiology*. 1999;20(6):402-7. 8. Herruzo-Cabrera R, pez G, nez R, Diez-Sebastian J, Lopez A, ero M-J, et al. Surgical site infection of 7301 traumatologic inpatients (divided in two sub-cohorts, study and validation): Modifiable determinants and potential benefit. *European Journal of Epidemiology*. 2004;19:163-9. 9. Olsen MA, Nepple JJ, Riew KD, Lenke LG, Bridwell KH, Mayfield J, et al. Risk Factors for Surgical Site Infection Following Orthopaedic Spinal Operations. *J Bone Joint Surg Am*. 2008;90(1):62-9. 10. Yokoyama K, Uchino M, Nakamura K, Ohtsuka H, Suzuki T, Boku T, et al. Risk factors for deep infection in secondary intramedullary nailing after external fixation for open tibial fractures. *Injury*. 2006;37(6):554-60. 11. Garner JS. CDC guideline for prevention of surgical wound infections, 1985. Supersedes guideline for prevention of surgical wound infections published in 1982. (Originally published in November 1985). Revised. *Infect Control*. 1986;7(3):193-200. 12. Polk HC, Jr., Simpson CJ, Simmons BP, Alexander JW. Guidelines for prevention of surgical wound infection. *Arch Surg*. 1983;118(10):1213-7. 13. Katz M. Multivariable analysis: a practical guide for clinicians. 2nd ed. Cambridge, England: Cambridge University Press; 2006. p. 96-116. 14. Vittinghoff E, McCulloch CE. Relaxing the rule of ten events per variable in logistic and Cox regression. *Am J Epidemiol*. 2007;165(6):710-8. 15. Harrell FE, Jr., Lee KL, Mark DB. Multivariable prognostic models: issues in developing models, evaluating assumptions and adequacy, and measuring and reducing errors. *Stat Med*. 1996;15(4):361-87. 16. National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 to June 2002, issued August 2002. *Am J Infect Control*. 2002;30(8):458-75. 17. Edwards C, Counsell A, Boulton C, Moran CG. Early infection after hip fracture surgery: risk factors, costs and outcome. *J Bone Joint Surg Br*. 2008;90(6):770-7. 18. Huotari K, Lyytikäinen O, editors. Impact of postdischarge surveillance on the rate of surgical site infection after orthopedic surgery; 2006. 19. Mackay DC, Harrison WJ, Bates JH, Dickenson D. Audit of deep wound infection following hip fracture surgery. *J R Coll Surg Edinb*. 2000;45(1):56-9. 20. Minnema B, Vearncombe M, Augustin A, Gollish J, Simor AE. Risk factors for surgical-site infection following primary total knee arthroplasty. *Infection Control and Hospital Epidemiology*. 2004;25(6):477-80. 21. Partanen J, Syrjala H, Vahanikkila H, Jalovaara P. Impact of deep infection after hip fracture surgery on function and mortality. *J Hosp Infect*. 2006;62(1):44-9. 22. Phillips JE, Crane TP, Noy M, Elliott TS, Grimer RJ. The incidence of deep prosthetic infections in a specialist orthopaedic hospital: a 15-year prospective survey. *J Bone Joint Surg Br*. 2006;88(7):943-8. 23. Pories SE, Gamelli RL, Mead PB, Goodwin G, Harris F, Vacek P. The epidemiologic features of nosocomial infections in patients with trauma. *Arch Surg*. 1991;126(1):97-9. 24. Thu LTA, Dibley MJ, Ewald B, Tien NP, Lam LD. Incidence of surgical site infections and accompanying risk factors in Vietnamese orthopaedic patients. *Journal of Hospital Infection*. 2005;60(4):360-7. 25. Morris C, Sepkowitz K, Fonshell C, Margetson N, Eagan J, Miransky J, et al. Prospective Identification of Risk Factors for Wound Infection After Lower Extremity Oncologic Surgery. *Annals of Surgical Oncology*. 2003;10(7):778-82. 26. Berbari EF, Hanssen AD, Duffy MC, Steckelberg JM, Ilstrup DM, Harmsen WS, et al. Risk factors for prosthetic joint infection: case-control study. *Clin Infect Dis*. 1998;27(5):1247-54. 27. Peersman G, Laskin R, Davis J, Peterson M. Infection in total knee replacement: a retrospective review of 6489 total knee replacements. *Clin Orthop Relat Res*. 2001;392:15-23. 28. Poss R, Thornhill TS, Ewald FC, Thomas WH, Batte NJ, Sledge CB. Factors influencing the incidence and outcome of infection following total joint arthroplasty. *Clin Orthop Relat Res*. 1984;182:117-26. 29. Surin VV, Sundholm K, Backman L. Infection after total hip replacement. With special reference to a discharge from the wound. *J Bone Joint Surg Br*. 1983;65(4):412-8. 30. Wilson MG, Kelley K, Thornhill TS. Infection as a complication of total knee-replacement arthroplasty. Risk factors and treatment in sixty-seven cases. *J Bone Joint Surg Am*. 1990;72(6):878-83. 31. Simchen E, Stein H, Sacks TG, Shapiro M, Michel J. Multivariate-analysis of determinants of post-operative wound-infection in orthopedic patients. *Journal of Hospital Infection*. [Article]. 1984;5(2):137-46. 32. de Boer AS, Geubbels EL, Wille J, Mintjes-de Groot AJ. Risk assessment for surgical site infections following total hip and total knee prostheses. *J Chemother*. 2001;13 Spec No 1(1):42-7. 33. de Boer AS, Groot A, Severijnen AJ, van den Berg JMJ, van Pelt W. Risk assessment for surgical-site infections in orthopedic patients. *Infection Control and Hospital Epidemiology*. [Article]. 1999;20(6):402-7. 34. Saleh K, Olson M, Resig S, Bershadsky B, Kuskowski M, Gioe T, et al. Predictors of wound infection in hip and knee joint replacement: results from a 20 year surveillance program. *J Orthop Res*. 2002;20(3):506-15. 35. Heier KA, Infante AF, Walling AK, Sanders RW. Open fractures of the calcaneus: soft-tissue injury determines outcome. *J Bone Joint Surg Am*. 2003;85-A(12):2276-82. 36. Lang GJ, Richardson M, Bosse MJ, Greene K, Meyer RA, Sims SH, et al. Efficacy of surgical wound drainage in orthopaedic trauma patients: A randomized prospective trial. *J Orthop Trauma*. [Article]. 1998;12(5):348-50. 37. Tjeenk RM, Peeters MP, van den Ende E, Kastelein GW, Breslau PJ. Wound drainage versus non-drainage for proximal femoral fractures. A prospective randomised study. *Injury*. 2005;36(1):100-4. 38. Muilwijk J, van den Hof S, Wille JC. Associations between surgical site infection risk and hospital operation volume and surgeon operation volume among hospitals in the Dutch nosocomial infection surveillance network. *Infect Control Hosp Epidemiol*. 2007;28(5):557-63. 39. Enstone JE, Humphreys H. Monitoring infective complications following hip fracture. *J Hosp Infect*. 1998;38(1):1-9. 40. Golden SH, Peart-Vigilance C, Kao WH, Brancati FL. Perioperative glycemic control and the risk of infectious complications in a cohort of adults with diabetes. *Diabetes Care*. 1999;22(9):1408-14. 41. Smyth ET, Emmerson AM. Surgical site infection surveillance. *J Hosp Infect*. 2000;45(3):173-84.
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- ### S025 Osteitis After Open Fractures
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- Introduction:** As open fractures increase the risk of infection we looked at the factors which cause osteitis in patients suffered from multiple trauma with at least one open fracture in a prospective study.

Material and Methods: Highlights of interest were: effect of the age location of the fracture soft-tissue damage other injuries/ISS antibiotic prophylaxis operative treatment massive transfusion of blood outcome.

Results: In the Trauma Center Murnau we treated between 1/2002 and 12/2005 926 patients with multiple trauma. 63 (6,45%) suffered from open fractures of at least one long bone. Finally, the study showed that 62% (n = 39) had a good outcome without infection oder pseudarthrosis. 3% (n = 2) developed an early infection, 6% (n = 4) an osteitis. The femur and the radius were the most frequent site of an open fracture, but 83% of the observed osteitis occurred in the tibia. 14% (n = 2) of the patients with a Gustilo grade II and 22% (n = 4) with a grade III developed osteitis. 67% (n = 4) of the patients developing an infection received a massive transfusion of blood (≥ 10 EK). We found no difference between the patients with infection and those without infection with regard to age, other injuries/ISS or kind of medical treatment.

Conclusion: Massive transfusion of blood predisposes to bone infection in patients with multiple trauma and open long bone fracture especially of the tibia.

Disclosure: No significant relationships.

S026 Septic Amputation

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Introduction: Is the progressive course of septic amputations predictable by additional diagnoses and the germs found in the wound?

Material and Methods: Retrospective analysis of all patients with septic major amputations between 01.01.2006 and 30.06.2009. Focus: Therapeutical course before and after amputation (number of operations before and after amputation) in relationship to co-morbidities and bacteria which caused the infection.

Results: Hospital data from 63 (15 female, 48 male) patients were available for 64 septic amputations in the lower extremities on account of non-manageable infections. The average age was 56.6 years (27 to 88 years). The first age peak lies with 46, the second with 78 years. In 15 cases infected endoprostheses were found (3 total hip arthroplasties, 12 total knee arthroplasties) in 49 cases osteomyelitis was diagnosed. Before amputation the patients underwent an average of 7.5 interventions (between 0 and 28) in order to control the infection. The average treatment period before the amputation was 39.76 days (from 1 to 117 days). Post amputationem an average 2.5 interventions were necessary (from 0 to 9). The average period of treatment was about 36.81 days (from 3 to 99 days). 3 exarticulations were carried out in the hip, 34 femoral amputations and 27 lower leg amputations were done. 4 further amputations in the area of the lower leg and 3 in the area of the thigh had to be proceeded. The microbiological analysis of the bacterial spectrum of the infection site lead to positive results in 57 patients (89.06%). *S. aureus* 31 x (19.23%), MRSA 16 x (16.86%), enterobacteria 11 x (12.05%), pseudomonas 8 x (10.84%), ESBL 4 x (9.64%), others 21 x (25.30%). In 6 patients the microbiological tests showed no bacteria (9.37%).

The analysis of the co-morbidities showed that hypertension was the most frequent, 19 cases (19.58%), followed by diabetes in 15 cases (15.46%), coronary disease in 8 cases (8.24%), obesity in 5 cases (5.14%) and COPD in 4 cases (3.88%).

Conclusion: A statistical relevant risk-assessment based on these data (correlation of microbiological findings co-morbidities and risk of amputation) cannot be carried out due to the relatively small number of patients. However, a trend may be estimated: Combination of MRSA, diabetes and cardiac disease in combination with a great number of operations leads to an increased amputation-risk independent to the individuals age.

References: Strategies for the analysis of osteitic bone defects at the diaphysis of long bones A. H. Tiemann, H. G. K. Schmidt, R. Braunschweig, and G. O. Hofmann Strategies Trauma Limb Reconstr. 2009 April; 4(1): 13–18. A practical guide to the diagnosis and management of bone and joint infections Mader JT, Mohan D, Calhoun J. Drugs. 1997 Aug;54(2):253-64.

Update on the diagnosis and management of osteomyelitis Mader JT, Ortiz M, Calhoun JH. Clin Podiatr Med Surg. 1996 Oct;13(4):701-24. Review

Disclosure: No significant relationships.

S027 The Basal Mechanism of Action: Maggot Debridement Therapy in Trauma Surgery

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Introduction: Maggot Debridement Therapy (MDT) as an ancient method is successfully used for the treatment of acute and chronic wound infections in trauma surgery¹. The underlying mechanisms of action of MDT are unknown, but could provide information for a novel treatment modality against infection, which is important in these times of increasing antibiotic resistance. Therefore, in this research the effect of living maggots on planktonic cells was investigated. Furthermore, the influence of maggot excretions on planktonic cells and on bacterial biofilms was tested.

Material and Methods: Sterile tubes were filled with living maggots in a bacterial suspension and every two hours samples were cultured and compared with controls. A turbidimetric assay was performed to test the susceptibility of six bacterial species to maggot excretions. Bacterial biofilms were formed in vitro on polyethylene, stainless steel and titanium and maggot excretions were added to test their influence.

Results: The results show that living maggots as well as their excretions stimulate the bacterial growth of *S. aureus*, *E. faecalis*, *CNS*, *S. pyogenes* and *K. oxytoca* (all p-values ≤ 0.0002). Only *P. aeruginosa* had a decrease of bacterial growth (p = 0.002). The strongest biofilms in vitro were formed by *S. aureus*, *S. epidermidis* and *P. aeruginosa* in contrast to the weak and inconsistent formed biofilms by *E. faecalis*, *E. cloacae* and *K. oxytoca*. For *P. aeruginosa*, stainless steel was the best biomaterial with respect to biofilm formation and

for *S. aureus* and *S. epidermidis*, the best biomaterial was titanium. Maggot excretions were added to the strongest biofilms, named above, and reduced these on all biomaterials. The maximal biofilm inhibition by maggot excretions was seen on polyethylene: 82% for *P. aeruginosa* ($p < 0.0001$), 61% for *S. aureus* ($p < 0.0001$) and 92% for *S. epidermidis* ($p < 0.0001$).

Conclusion: This study shows that nor living maggots, neither maggot excretions have direct antibacterial properties. However, maggot excretions do reduce biofilms formed by different bacterial species on commonly used biomaterials. Future research will focuss on the exact mechanism and the substance(s) that cause biofilm reduction. Furthermore, possible indirect antibacterial activity will be investigated and the potential role herein of the immune system.

References: 1 Jukema GN, Menon AG, Bernards AT, Steenvoorde P, Taheri Rastegar A, van Dissel JT. Amputation-sparing treatment by nature: "surgical" maggots revisited. *Clin Infect Dis.* 2002 35:1566-1571.

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S028 Management of Tetanus Prone Wounds in Orthopaedic Trauma Patients

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Introduction: Tetanus is an acute disease caused by a neurotoxin produced by the bacterium *Clostridium Tetani*, characterised by generalised rigidity, muscle spasm and fatality. Open orthopaedic injuries are at particular risk of developing infection from tetanus spores found in the environment. The UK Department of Health has established guidelines for the prevention of tetanus infection. We assessed the adherence of these guidelines on the initial pre-operative management of tetanus prone open orthopaedic injuries in trauma patients admitted for surgery.

Material and Methods: A retrospective case note review was conducted on 53 patients admitted to the orthopaedic department for intervention with a tetanus prone wound between February 2009 and June 2009. Tetanus prone injuries included open fractures, soft tissue injury requiring surgical intervention that is delayed for > 6 h, wounds with significant devitalised tissue, wounds in contact with soil and open injuries containing foreign bodies. We assessed to what extent these patients had their immunisation status ascertained, application of wound irrigation and appropriate dressing, correct tetanus prophylactic cover (tetanus toxoid booster versus human tetanus immunoglobulin) and appropriate administration of antibiotics.

Results: Of the 53 patients included in the study, 32 (60%) of patients were considered to have a 'high risk' tetanus prone injury and 21 (40%) patients were deemed as having a 'low risk' clean wound based on the nature and extent of injury. Performance within the high risk category showed that 59% of patients had their tetanus immunisation status ascertained, 72% correctly received wound irrigation and betadine dressing, 75% of patients were appropriately given prophylactic antibiotics. Only 9% of patients with a high risk tetanus prone wound received tetanus immunoglobulin and 72% of

patients were given a tetanus toxoid booster as a method for prophylaxis.

Conclusion: Our study showed that a large proportion of patients correctly received supportive wound care and antibiotics. We also demonstrated that patients with open tetanus prone orthopaedic injuries are not adequately receiving correct tetanus immunoglobulin as the indicated prophylaxis. A large number of patients were given tetanus toxoid instead, which does not protect immunity early enough to cover the acute injury period, thus posing a major risk of developing a devastating and largely preventable infection. The orthopaedic and trauma doctor attending these patients must adhere closely to the correct initiation of simple measures in the management of tetanus prone orthopaedic wounds.

References: United Kingdom Department of Health. Chapter 30 Tetanus. In: Immunisation against infectious disease - The Green Book. London: Department of Health; 2006: 367-384. Thwaites CL, Farrar JJ. Preventing and treating tetanus. *BMJ.* 2003; 326:117-118.

Disclosure: No significant relationships.

S029 The Incidence of Clostridium Difficile and Wound Infections Related to Two Antibiotic Prophylaxis Regimes for Metalwork Implantation in Trauma and Orthopaedic Surgery

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Introduction: There has been a substantial increase of *Clostridium Difficile* (*C.difficile*) in Europe over the last decade. This increased incidence of *C.difficile* has been attributed in part to the prophylactic use of antibiotics during orthopaedic and trauma surgery. The consequences of a *C.difficile* infection can be an increase in mortality, length of stay and cost of medical care. The mortality associated with *C.difficile* has been quoted to be up to 25% in frail elderly people and the cost of treating a single case of *C. difficile* infection has been estimated at 4500 Euros (£4000).

The antibiotic prophylaxis for orthopaedic and trauma patients undergoing metal work implantation was changed in our unit to specifically reduce the incidence of *C.difficile*. The aim of this study was to determine whether this change did reduce the incidence of post-operative *C.difficile* infections presenting on the orthopaedic ward. The secondary aim was to ensure that the change in prophylaxis did not increase the incidence of deep wound infections.

Material and Methods: The old prophylactic protocol involved a dose of Cefuroxime at induction, followed by two further doses post-operatively. The new protocol was a single dose of Gentamicin and Flucloxacillin or a single dose of Gentamicin and Teicoplanin (if MRSA positive or penicillin allergy) at induction. The incidence of *C.difficile* infection and deep wound infection were recorded for a six month period prior to the protocol change and for a six month period once the new antibiotic protocol had been established. Patients included into the study were those undergoing a primary arthroplasty

of the knee or hip and patients undergoing metalwork implantation for a proximal femoral fracture.

Results: 1566 patients were included in the study. The overall rate of C.difficile infection reduced from 3.7% to 1.3% ($p < 0.005$) after the prophylactic antibiotic protocol was changed. This was most marked in the trauma patients from 8% to 3% ($p < 0.05$). There was no significant difference in the incidence of deep wound infections for the trauma patients ($p = 0.5$) or the elective patients ($p = 0.7$).

Conclusion: The change in antibiotic prophylaxis did significantly reduce the incidence of C.difficile in patients undergoing metalwork implantation and did not change the rate of deep wound infections.

References: L Clifford McDonald et al. 2005.

Pepin J et al. 2004.

Riley et al. 1996.

Edlund C et al. 1991.

Ambrose N.S et al. 1985.

De lalla et al.1989.

Impallomeni M et al. 1995.

Wilcox MH et al. J Hosp Infect 1996.

Wilcox MH et al. 1998.

Archibald LK et al. 2004.

McDonald LC et al. April 17-20, 2004.

T. I. I. van der Kooi et al. 2008.

Spencer RC et al. 1998.

NIH consensus conference: total JAMA 1995.

Sperling JW et al. 2001.

Harris WH et al. 1990.

Blomfeldt R et al. 2005.

Health protection agency.

Disclosure: No significant relationships.

S030 Vacuum Assisted Closure for the Management of Open Fractures with Soft Tissue Injuries

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Introduction: The aim of this study is to evaluate the results of vacuum assisted closure (VAC) technique in type II & III open fractures.

Material and Methods: From October 2006 to September 2008, 15 patients and 17 extremities which had open fractures of Gustilo-Anderson type II & III were treated in the Department of Orthopaedics & Traumatology, Medical Faculty of Ege University. All patients were irrigated and debrided, before the application of VAC system. Required debridements were maintained during VAC therapy. Time elapse between the injury time and VAC application time was 5 days on the average (min 0, max 10). When the granulation tissue became sufficient to cover the bone, these wounds have been closed secondarily with several methods. Time elapse between the start of VAC and wound closure or formation of sufficient granulation tissue for grafting was 12 days on the average (min 8, max 17).

Results: Distribution Mean postinjury time for the osteosynthesis was 44,5 (2-168) hours. Three of these wounds were closed spontaneously without any need for other wound closure procedures. Split thickness grafting is applied in 8 patients, free flap to 2 patients, full thickness grafting to 3 patients, secondary suturing was applied in 1 wound to close it. There was no infection in any extremities that we had osteosynthesed by internal or external methods.

Conclusion: Wound care is as much important as osteosynthesis in open fractures. Even if osteosynthesis is successful, failures in wound care may result in loss of extremity. VAC alone does not suffice for wound closure. Expectation in this therapy is to obtain ideal granulation tissue and to prevent infection development via appropriate wound care. The greatest disadvantage of VAC therapy at the time being is its high economic cost.

References:

1-Use of vacuum-assisted closure and a dermal regeneration template as an alternative to flap reconstruction in pediatric grade IIIB open lower-extremity injuries. Barnett TM, Shilt JS. Am J Orthop. 2009 Jun;38(6):301-5. 2-Vacuum-assisted closure therapy increases local interleukin-8 and vascular endothelial growth factor levels in traumatic wounds. Labler L, Rancan M, Mica L, Härter L, Mihic-Probst D, Keel M. J Trauma. 2009 Mar;66(3):749-57. 3-Routine use of wound vacuum-assisted closure does not allow coverage delay for open tibia fractures. Bhattacharyya T, Mehta P, Smith M, Pomahac B. Plast Reconstr Surg. 2008 Apr;121(4):1263-6.

Disclosure: No significant relationships.

S031 Negative Pressure Wound Therapy (NPWT) in the Management of Open Tibial Fractures: The Effect on Infection Rates

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Introduction: The use of Negative Pressure Wound Therapy (NPWT) in the soft tissue management of open tibial fractures after the initial irrigation and debridement is becoming widespread in many centres. The aim of this study was to evaluate the effect of NPWT on infection rates in open tibial fractures compared to conventional dressings.

Material and Methods: A retrospective cohort study was conducted to compare infection rates in patients who had open tibial fractures which were managed with NPWT to those treated with conventional dressings. Patients admitted to two Level 1 trauma centres during 2002 – 2007 who underwent at least two operative wound debridements before definitive soft tissue coverage were included. Those patients with fractures which underwent primary amputation or who died were excluded. The patients were identified from trauma

databases at each hospital and data was collected from medical records and radiographs.

Results: A total of 229 open tibial fractures in 220 patients were included and received either NPWT (166/229 - 72%) or conventional dressings (63/229 - 28%) exclusively. There was a significantly higher proportion of Gustilo IIIB fractures (50% vs 25%; $p < 0.05$), major chest injuries (31% vs 18%; $p < 0.05$) and major abdominal injuries (7% vs 0%; $p < 0.05$) in the NPWT group. This may represent a selection bias, with more severely injured patients being treated preferentially with NPWT. Despite this potential bias, there was a decreased rate of deep infection in the NPWT group compared to the conventional dressing group (8.4% [14/166] vs 20.6% [13/63]; $p < 0.05$). Univariate predictors of deep infection included Gustilo type (OR 3.132 [95% CI 1.740 – 5.638]; $p < 0.05$) and use of NPWT (OR 0.354 [95% CI 0.156 – 0.804]; $p < 0.05$). When adjustment was performed for Gustilo type with multivariate analysis, the use of NPWT was found to reduce deep infection by almost 80% (OR 0.219 [95% CI 0.087 – 0.552]; $p < 0.05$).

Conclusion: These results suggest that NPWT reduces the rate of deep infection when used in the soft tissue management of severe open tibial fractures. This study supports the continued use of NPWT for this indication.

Disclosure: No significant relationships.

LIVER

S032 Comparison of Two Haemostatic Agents in a Porcine Liver Trauma Model

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Introduction: Surgical haemostasis in trauma patients can be difficult and hazardous. Commercial products are promoted to accomplish this task at a reasonable cost. In this study we compared the effectiveness of two topical gelatin-based haemostatic agents, Floseal® and Surgiflo® in a porcine liver trauma model.

Material and Methods: We compared the activity of Floseal® (with human or bovine thrombin), Surgiflo® and Surgiflo® with added bovine thrombin in two porcine models. One anaesthetised piglet mimicked “normal” conditions, while the other was kept in a status of hypotension, hypothermia and haemodilution, necessitating inotropic support (“critically ill”). Laparotomy was performed, after which we inflicted five identical stab wounds on each liver lobe. Each wound was treated with one of the four agents, while one wound was

kept as a control. Haemostasis was evaluated clinically. After euthanizing the piglets, the pathologist performed a macroscopic, microscopic and electron microscopic evaluation, blinded for which agent was used in which wound.

Results: Clinically, Surgiflo® was able to produce a clot in some of its applications in the healthy piglet (“normal” conditions), which was not the case in the critically ill animal, not even with the added thrombin. Floseal® induced clotting in every wound. Both microscopic (hematoxylin and eosin and Mallory stain) and electron microscopic examination of the stab wounds confirmed that Floseal® created a stable and dense agglomerate of gelatin and fibrin, firmly attached to the adjacent liver tissue, whereas with Surgiflo®, the gelatin contained more air bubbles, there was a lot less fibrin included in the clot and the clot was not strongly adherent to liver tissue.

Conclusion: It would seem that Floseal® is a superior haemostatic agent, creating a dense and stable blood clot, even in a critically ill animal, hence ensuring haemostasis.

Disclosure: No significant relationships.

S033 Comparison of Ankaferd Blood Stopper and Fibrin Glue in an Experimental Partial Splenectomy

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Introduction: Bleedings stemming from splenic traumas are still among important causes of morbidity and mortality. Aim of this study is comparison of fibrin glue with hemostasis effectiveness of Ankaferd Blood Stopper lower lob resections on spleen of rats.

Material and Methods: The study was performed at the animal laboratory of Istanbul University after obtaining an approval from the Ethics Committee. Twenty-four rats were randomly divided into three groups, namely, fibrin glue group (n = 8), ABS group (n = 8) and control group (n = 8). A wedge resection was performed on the lower lobe of the spleen. In fibrin glue group, spleen was hemostasis with fibrin glue (Tisseel), while ABS was administrated on the lower lobe surface in ABS group. Chronometric measurements were made to determine bleeding times. Blood samples from the tail and vena cava were used for whole blood count and blood chemistry. Histopathological scores were measured postoperatively on day 5 th.

Results: In ABS group, chronometric bleeding period is 11,5 s. Whereas in fibrin glue group it takes 10,8 seconds ($p > 0,05$). It was noted that the hemogramme test results, hemoglobin and hematocrit levels on the 5th days of ABS and fibrin glue groups did not show sensible differences from one another (13,5 vs 13,9) $p = 0,022$ (41,63 vs 42,50) $p = 0,879$.

Conclusion: There are no differences between the hemostasis speed and effectiveness of Ankaferd Blood Stopper and fibrin glue as an applied material in bleeding stemming from experimental partial lower lob resections on spleen of rats.

Disclosure: No significant relationships.

S034 Liver Injury in Abdominal Trauma: How Much does the Multiplicity of Organ Injuries Influence the Choice Between Surgical and Non Operative Management? Our Experience and Review of Literature

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Introduction: Non operative management of liver trauma is considered by now as the Gold Standard treatment for moderate-stable hemorrhagic and lacerative injuries in a patient where the hemodynamic stability is reached. A worldwide consensus about the management of serious multi-organ damages, especially if liver trauma is associated with renal or splenic injury, has not been already reached. We report about our experience with this kind of patients, comparing our results in surgical and non-operative managements with literature.

Material and Methods: We reviewed retrospectively our database from 2004 to 2009, selecting a group of 26 liver injury. Data were collected for all patients about: age, sex, comorbidities, sequence of events, type and number of associated lesions, surgical management, morbidity and mortality. All liver and other organ's injuries were evaluated by abdominal CT scan with contrast and classified according to CT-based scale for trauma. Patients were divided into 2 groups by the kind of treatment (operative/non operative) and statistically compared with Fisher's test.

Results: Middle age was 33 ± 13 SD years and 76.9% of patients were male. 16.5% of patients presented comorbidities at the admittance, with obesity and diabetes as the most frequent disease. The abdominal trauma was blunt in 84.6% of cases and the CT grade of lesion was 3° or higher in 57.7% of patients. Overall mortality has been of 3.84% and infections or bleeding were reported as the most frequent complications: in 23% of cases. This lower rate of morbidity and mortality founded in our patients if compared with data in literature is partially influenced by the small number of 5° grade lesions treated. Non operative management was undertaken in 79.2% of patients. In the group of non surgically managed patients, the mean number of organs injured was 2 ± 0.12 SD. In the group of patients that underwent explorative laparotomy the mean of organs involved was 2 ± 1.09 . In this group associated lesions were: spleen (87.2%), kidney (22.1%) and bowel (2.1%). Only in 12.3% of patients operated the hemodynamic stability was reached and a significant relationship with surgical management was founded (P -value = 0.0012).

Conclusion: By our experience, we believe that multiplicity of organs lesion associated with liver trauma, DOESN'T influence directly the choice of the surgical management. Only hemodynamic stability is confirmed to be strongly joined with the decision to operate. Among the associated lesions, splenic injuries are the most frequent in surgically managed patients. A prospective study has been planned to confirm this preliminary data.

References: 1. Frank Hildebrand, Michael Winkler, Martijn van Griensven et al. "Blunt Abdominal Trauma Requiring Laparotomy: an Analysis of 342 Polytraumatized Patients" European Journal of Trauma 2006. 32: 5; 430-438 2. Mackerzie. Pitfalls in the Evaluation and management of the trauma Patient. Curr Probl Surg. December, 2007, Vol. 778-833, 44. 3. M. Gage Ochsner, M.D. Factors of Failure for Nonoperative Management of Blunt Liver and Splenic Injuries. World J. Surg. 2001, Vol. 25, 1393-1396. 4. Beck, D, Marley, R, Salvator, A, Muakkassa, F. Prospective study of the clinical predictors of a positive abdominal computed tomography in blunt trauma patients. J Trauma. 2004, Vol. 57, p. 296. 5. George C. Velmahos, MD, Konstantinos Toutouzas, MD e Randall Radin, MD. High Success With Nonoperative Management. Arch Surg. 2003, Vol. 138, p. 475-481.

Disclosure: No significant relationships.

S035 Major Liver Trauma in Unstable Patients and Intra-Abdominal Hypertension: Challenging Non-operative Management Over the Limits

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Introduction: Non Operative Management (NOM) of major liver injuries in polytrauma patients has dramatically decreased morbidity and mortality. In presence of hemodynamic instability, urgent laparotomy and damage control surgery are still mandatory.

Material and Methods: In 2007 we admitted at our level I Trauma Center two polytrauma patients (ISS respectively 34 and 41 and RTS 7.1 and 5.9) with grade IV liver injury and large hemoperitoneum CT-documented, hemodynamically unstable. Upon availability of Trauma ICU with continuous monitoring, angiography room for embolization, trauma theatre and surgical Trauma team at 24/7 basis, NOM was decided.

Results: Both patients remained unstable in the first 12 h in TICU. They were transient responders to fluid resuscitation and multi-transfused. The presence of hemoperitoneum leading to a moderate Intra Abdominal Hypertension (IAH), monitored by continuous intra-abdominal pressure measurement, was tolerated and resulted in achievement of a Non-Operative control of hemorrhage. The mean values of abdominal pressure in TICU were respectively 25.4 (range 13-40) and 18.6 (range 14-22) mmHg (Class III-IV and Class II IAH). The patients vitals were monitored. After arresting hemorrhage and achieving hemodynamic stability, US-guided drainage

of the hemoperitoneum in right iliac fossa was performed 6 and 7 days after trauma, resulting in drainage of 2600 and 4200 cc of blood. Patients were discharged 1 month later and follow up was successful.

Conclusion: In selected hemodynamically unstable patients and upon availability of appropriate facilities, NOM can be safely challenged over the usual limits. The indicators of tissue perfusion such as pH and BE seems to be more reliable and sensitive prognostic parameter than hemodynamic instability evaluated by blood pressure and heart rate, in selecting the patients needing surgical control of hemorrhage. A moderate IAH in young patients able to tolerate an increased intra-abdominal pressure, can allow a mechanical compression of the injured parenchyma achieving the arrest of hemorrhage, and extend the indications for NOM in selected hemodynamically unstable patients, without signs of severe tissue hypoperfusion.

References: [1] Richardson JD. et al. Evolution in the management of hepatic trauma: a 25 years perspective *Ann Surg* 2000; 232:324-30 [4] Tugnoli G. et al. The Damage control in severe hepatic trauma injuries: our experience *Ann Ital Chir* 2003; 74(5):529-34 [5] Asensio JA et al. Operative management and outcomes in 103 AAST-OIS grades IV and V complex hepatic injuries: Trauma surgeons still need to operate, but angioembolization helps *J Trauma* 2003; 54(4): 647-54 [8] Gourgiotis S et al. Operative and nonoperative management of blunt hepatic trauma in adults: a single-center report *J Hepatobiliary Pancreat Surg* 2007; 14:387-91.

Disclosure: No significant relationships.

S036 Combined Open and Endovascular Surgery Management of a Grade 5 Liver Injury with Extensive Lesion of the Retrohepatic Vena Cava

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Introduction: To describe the combined use of open and endovascular surgery techniques in a patient with grade 5 injury to the liver and retrohepatic vena cava after blunt trauma and a call for more case reports and studies in these difficult injuries.

Material and Methods: Our case describes a 51 year old male who fell 7 m and landed on the right side of his torso dislocating a rib through the diaphragm, causing a transecting grade 5 liver injury to liver lobes IV and VII, the right hepatic artery and a lesion of the retrohepatic vena cava (VC). The patient presented alert, hemodynamically stable with normal breath sounds. CT scan showed right sided hemothorax and a grade 5 liver injury. A right sided chest tube drained 600 ml of blood. The patient became unstable and was transferred to the OR. Profuse haemorrhage from the liver was encountered and massive blood transfusion protocol was initiated. The right hepatic artery showed to be injured and was ligated. Pringles manoeuvre and packing of the liver were not enough to control the bleeding. An injury to the retrohepatic VC was suspected and manual compression was not sufficient to gain control. Endovascular assistance was called for and using a bilateral Femoral vein approach two occlusive balloons were placed and inflated under X-ray and open view in the VC to gain proximal and distal control.

The patient stabilized and the injury to the VC could be sutured and covered with a topical haemostatic agent. The balloons were deflated but were left in place as a security measure. The liver was then again packed. The Pringle manoeuvre had intermittently been used for approximately 2 h in total. Two vessel loops were left tension free around the hepatoduodenal ligament and brought out through the midline incision as a security measure. 60 units of RBCs, 30 units of FFPs and 2 units of platelets were given. Angioembolization of the right hepatic artery was performed after the first surgery. During the second operation, the haemostats, vessel loops and occlusion balloons could safely be removed. 15 days after the injury the patient showed increasing signs of liver failure. The patient was accepted for liver transplantation 22 days after the injury; this procedure was carried out successfully.

Results: The combined open and endovascular approach in this case was crucial. The nature of the injury, the Pringle manoeuvre, packing of the liver and arterial embolization caused permanent damage to the liver which had to be managed with liver transplantation which was successful. The use of endovascular occlusive balloons might also have had a role in the permanent damage of the liver, but had great benefit in saving the patients life.

Conclusion: These cases are very difficult to control by open technique alone. Endovascular occlusion balloons can successfully be used for temporary hemostasis in the injured vena cava.

Disclosure: No significant relationships.

S037 Missed Right Sided Diaphragm Ruptures by Imaging

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Introduction: Evaluation of trauma patients with suspicion of a diaphragm rupture (DR) presenting at a Level 1 trauma centre. The main goal of this study was to investigate whether DR which was suspected at imaging (ultrasound, X-ray-, CT-imaging), was found during operative procedure.

Material and Methods: In this retrospective study 45 patients with suspicion at DR were included in the period during january 1988 till january 2008. The DR were caused by blunt and penetrating trauma. The collected data were analysed with SPSS 15.0.

Results: The study group consisted of 45 patients, 35 male (77.8%) and 10 female (22.2%) patients. The mean age is 43.5 year, with a range of 16-86. The DR were caused by blunt trauma (66.7%) and penetrating trauma (28.9%). The penetrating trauma were caused by stab wounds (15.6%), shot wound (13.3%). In 2 cases (4.4%) the DR were due to iatrogenic intervention.

Imaging was performed in almost all patients, only 24.4% were unstable and surgery was performed immediately. The suspicion on imaging of a DR proved to be correct in 51.1%, 2.2% had congenital elevated diaphragm. In 42.2% of the patients the diagnose DR was missed and found during surgery.

Remarkable, 78.5% of the right sided DR were missed (28.9% of the total DR were right sided).

Conclusion: Imaging proved it's necessity for multi-trauma patients in detecting DR in 51.1% cases. Remarkable few right sided DR were found by imaging.

Disclosure: No significant relationships.

S038 Blood Transfusion Requirement and Hemodynamic During Initial Assessment and Early ICU Stay in the Non-operative Management of Liver Injury

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Introduction: Background: Non-operative management of solid organ injury after blunt abdominal trauma is the accepted standard of care in most countries. Blood requirement and hemodynamic alterations are two of the most important parameters which guide the opportunity for an immediate laparotomy. Blood loss due to extra-liver injuries contributes to circulatory derangement in polytrauma patients.

Material and Methods: Study design: Retrospective, observational study of transfusion practices and hemodynamic assessment in patients with blunt liver injury non-operatively treated was evaluated.

Results: Forty-four patients with blunt liver trauma were studied. Patients with isolated liver injury had a higher t-RTS than those of patients with liver and associated multiple injuries, 11.7 ± 0.6 vs 11.1 ± 1.2 (mean \pm SD), respectively ($p = 0.04$). At admission in Emergency Room (ER) nine patients (20.4%): two pts (22%) with isolated liver injury and seven pts (78%) with liver and associated injuries, had a systolic blood pressure lower than 90 mmHg. In ER the mean hemoglobin level was 10.3 ± 2.4 g/dl and 7.8 ± 0.8 g/dl (mean \pm SD) respectively in patients with isolated liver injury and patients with extra-hepatic injuries ($p < 0.01$). Thirteen patients required red blood cell transfusions: three pts (23%) with isolated liver injury and ten pts (77%) with liver and associated injuries. In the ER the mean blood transfusion requirement was 0, 0, 0, 320, 640 ml in pts with isolated liver injury and 0, 256, 320, 160, 0 ml respectively in OIS I, II, III, IV and V liver grade injury.

Conclusion: In patients with polytrauma, blood loss due to extra-hepatic injuries could be responsible of hemodynamic instability and blood requirement more than liver injury.

Disclosure: No significant relationships.

S039 The Effect of Liver Injury on the Incidence of Pulmonary Failure in Trauma Patients: A Multivariate Analysis

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Introduction: The incidence of pulmonary failure in multiple trauma patients is postulated to be influenced by several factors such as thoracic trauma and liver injury. The incidence of pulmonary failure increases in patients with an Abbreviated Injury Scale thorax ≥ 3 (AIS) and they are more likely to face poor outcome. Thus, the aim

of the present study was to test the hypothesis that patients sustaining significant thoracic trauma (AIS thorax ≥ 3) in combination with a relevant liver injury (AIS liver ≥ 3) are more likely to develop pulmonary failure when compared to patients which sustained thoracic trauma without additional liver injury.

Material and Methods: Records of multiple trauma patients documented in the Trauma Registry of the German Society for Trauma Surgery were analyzed using uni- and multivariate analyses. Patients were subdivided into four groups according to their liver and thoracic injury: group 1 (AIS thorax < 3 ; AIS liver < 3); group 2 (AIS thorax ≥ 3 ; AIS liver < 3), group 3 (AIS thorax < 3 ; AIS liver ≥ 3) and group 4 (AIS thorax ≥ 3 ; AIS liver ≥ 3). Potential relevant variables were subjected to univariate analysis between groups using the chi square test to predict the probability for pulmonary failure rate. Subsequently, multivariate logistic regression analysis was performed, employing pulmonary failure as the dependent variable. Differences at the level of $p < 0.01$ were considered statistically significant.

Results: 12,585 patients with a mean age of 40.8 ± 10.7 years and a mean ISS of 28.6 ± 11.1 points fulfilled the inclusion criteria and were enrolled in this study. The overall rate of pulmonary failure was $21 \pm 40\%$. 12% of the patients in group 1, 26% in group 2 and 16% in group 3 developed pulmonary failure. The largest proportion of patients (36%) who developed pulmonary failure was found in group 4. Those factors which proved to show a significant correlation with the incidence of pulmonary failure were included in a subsequent multivariate analysis. However, the presence of relevant lung injury, male gender, pre-existing medical conditions (PMCs), transfusion of more than 10 packed red blood cells (PRBCs) as well as ISS and age played a significant role. In contrast to our hypothesis, liver injury did not prove to be associated with the incidence of pulmonary failure.

Conclusion: Pulmonary contusion and significant liver injury seem to have a synergistic effect on the incidence of pulmonary failure. However, multivariate analysis with adjustment of further relevant factors reveal, that liver injury is not a predictive factor for the incidence of pulmonary failure. Rather male gender and reported PMCs together with relevant lung injuries are more likely to develop pulmonary failure following multiple trauma. Nevertheless, patients with combined pulmonary and liver injury are at higher risk for pulmonary failure with critical outcome.

Disclosure: No significant relationships.

THORAX

S040 Analysis of 748 Patients with Thoracic Trauma Requiring Hospitalization

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Introduction: In this study, the demographic features and treatment results of our patients hospitalized due to thoracic trauma were presented and it was aimed to share our experience.

Material and Methods: Chart records of the 748 patients hospitalized due to thoracic trauma between 1994 and 2008 were investigated retrospectively. The patients were analyzed according to age, gender, the type of trauma, diagnostic procedure, clinical findings, presence

of accompanying trauma, surgical intervention and its indications, duration of hospitalization, complication and mortality.

Results: Of our cases, 673 (90%) were male and 75 (10%) were female. The median age was 31.9 (5 to 94) years. Of our patients with thoracic trauma, 377 (50.4%) had blunt and 371 (49.6%) had penetrating traumas. The most common causes of thoracic trauma were gun shot wounds (n = 294, 39.3%), vehicle accidents (n = 279, 37.3%) and stab wounds (n = 77, 10.3%). The most common clinical pictures were hemothorax (n = 174, 23.3%), hemopneumothorax (n = 154, 20.6%), pneumothorax (n = 142, 19%), pulmonary contusion (n = 136, 18.2%) and rib fracture (n = 104, 13.9%). Mean duration of hospitalization was 6.97 days, and mortality rate was 0.014%.

Conclusion: The most important cause, which increases mortality in thoracic traumas is associated organ injuries. The patients with thoracic trauma should be carefully be examined with respect to probable associated organ injuries.

Disclosure: No significant relationships.

S041 Thoracic Trauma in Elderly Patients

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Introduction: Aim of this study is to determine the clinical characteristics and outcome of hospitalized elderly patients with thoracic traumas.

Material and Methods: We retrospectively reviewed 70 consecutive patients with a mean age of 64.6 years, who were treated for thoracic injury during a 8-years period.

Results: Fifty-six of the patients were male (80%) and 14 (20%) were female. Majority of the patients had blunt trauma (n = 64, 91.4%). Penetrating trauma occurred in only 6 (8.6%) cases. The causes of blunt trauma were falls in 30 (46.9%), traffic accidents in 32 (50%) and due to cow hit in 2 (3.1%) cases. Twenty-four (34%) patients had co morbid disease such as chronic obstructive pulmonary disease (COPD) and cardiac problems. Fifty-one patients (73%) had isolated thoracic injuries. However, 19 (27%) patients had additional other system injuries. The most common thoracic injury was rib fracture with or without hemopneumothorax (n = 57, 81%). Other common thoracic injuries were pneumothorax in 28 cases (40%) and hemothorax in 26 cases (37%). Only two (2.9%) cases underwent urgent thoracotomy because of bleeding. Mean hospital stay was 5.8 days. The revised trauma score (RTS) was 6.5 for all cases. It was 7.1 in isolated thoracic injury cases and 4.8 in multiple injury cases. There was no mortality in isolated thoracic injury cases. But the mortality rate was 26.3% (5/19) in multiple injury cases.

Conclusion: The morbidity of thoracic trauma is relatively high in elderly patients, because of some co morbid disease such as chronic obstructive pulmonary disease (COPD) and cardiac problems. If there is an additional extra thoracic injuries, the rate of morbidity and mortality will be also higher. Therefore hospitalization and observation (at least 24-48 h) should be considered for elderly patients with thoracic trauma.

References: 1-Lotfipour S, Kaku SK, Vaca FE, Patel C, Anderson CL, Ahmed SS, Menchine MD. Factors associated with complica-

tions in older adults with isolated blunt chest trauma. *Wet J Emerg Med*, 2009;10(2):79-84.

2-Pudelek B. Geriatric trauma: special needs for a special population. *AACN Clin Issues*. 2002, 13(1):61-72.

3-McMahon DJ, Schwab CW, Kauder D. Comorbidity and the elderly trauma patient. *World J Surg*. 1996, 20(8):1113-9.

Disclosure: No significant relationships.

S042 The Influence of Thoracic Trauma Upon Evolution of Polytraumatised Patients

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Introduction: Thoracic trauma is the leading death cause in 25% of politraumatized patients and contributes to the death of another 25% of these fatalities. Identifying the determining causes, assessing their severity, early and qualified intervention in a multidisciplinary team may improve outcome of these patients. The goal of this paperwork is to assess the effects of thoracic trauma on clinical management, morbidity, mortality and outcome.

Material and Methods: Retrospective study of 740 politraumatized patients admitted in the Emergency Department of St. Pantelimon Hospital between Jan 2001 and Jun 2005. The followed parameters were most common injuries, severity, mortality, survival rate correlated with ISS and RTS, using data from emergency charts, hospital charts and anatomopathologic exams.

Results: Out of 740 patients, 445 associated thoracic trauma, with a survival rate of 79.1%. 410 patients had blunt trauma. Injuries that claimed early surgical intervention and had the highest death rate were: massive haemothorax 15 patients (100% mortality rate), aortic and great vessels injuries 6 patients (100% mortality rate), open pneumothorax 1 patient (100% mortality rate), tension pneumothorax 10 patients (50% mortality rate), flail chest 30 patients (53% mortality rate).

Conclusion: Thoracic trauma is often associated to politrauma and may increase significantly the mortality rate of these patients. Life-saving surgical procedures must be immediately performed, on patient arrival. It is important to adopt intervention protocols for multiple trauma, with a leading role of the Emergency Department medical staff.

Disclosure: No significant relationships.

S043 Treatment of Hemothorax From Penetrating and Contusive Trauma. A Single Institute Experience of 135 Cases

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Introduction: To evaluate treatment modalities of penetrating and/or contusive hemothorax, we reviewed our experience with patients admitted for traumatic hemothorax to our Center for Thoracic Surgery.

Material and Methods: From January 1998 to May 2009 we treated 135 consecutive patients (mean age, 47 + 22 SD years; M/F, 111/24) presenting traumatic hemothorax: 122 patients had contusive hemothorax (CONT) following car accident (28%), fall (27%), motorbike accident (25%), crushing trauma (7%), bike accident (3%); 13 patients had penetrating trauma (PEN) following stab wound (6.5%), gunshot (2%) and impalement (1.5%). We recorded demographic data, Injury Severity Score (ISS) at admission, endo- and extrathoracic injuries, method of treatment and outcome.

Results: There were no statistically significant differences between CONT group and PEN group regarding mean age (47 vs 45 years), gender (M/F = 100/22 vs 11/2), mean ISS (30 vs 28) and ICU admission rate (51% vs 54%). The CONT group however presented a higher rate of extrathoracic lesions (bone, visceral, CNS) than the PEN group (71.3% vs 31%; $p < 0.005$). In all patients a chest tube was immediately inserted, as the definitive treatment in 75% of CONT pts and in 46% of PEN pts ($p < 0.05$). Surgical treatment was mandatory respectively in 31/122 pts (25%) of CONT pts and in 7/13 pts (54%) of PEN pts. All 7 patients with PEN trauma received urgent thoracotomy on the same day of admission, whereas 16/122 (13%) of CONT pts had videothoracoscopic (VTS) treatment (5 + 4 days from trauma) and only 15/122 (12%) pts had open thoracotomy on the same day ($p < 0.001$ compared with PEN hemothorax). Perioperative mortality was higher in the PEN group, but not statistically different (8.1% CONT vs 15.3% PEN, $p = 0.3$).

Conclusion: Compared to CONT patients, the PEN patients were at higher risk, requiring immediate thoracotomy for treatment in 54% of cases; in 13% of CONT patients, VTS treatment was necessary to remove clots and allow lung reexpansion and it was performed successfully in all such cases a few days after trauma.

Disclosure: No significant relationships.

S044 Penetrating Trauma to the Chest in Amsterdam. Breathtaking results?

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Introduction: Evaluation of penetrating injuries to the chest presented at a Level 1 traumacentre. The main study question was to see whether there was an increase in incidence in time.

Material and Methods: In this retrospective study fifty-nine consecutive patients were included with penetrating injuries of the chest during the period of June 2004 until June 2008. The penetrating injury had to be caused by gunshot or stab incident. Statistical analyses of the data was performed using SPSS 16.0.

Results: The study group consisted of fifty-nine patients. Ninety percent were male with a mean age of 36 years (range 17-64). The mechanism of injury were stab (79,9%) and gunshot wounds (20,3%). Sixteen patients required a thoracotomy. In four other cases a laparotomy was performed. Twenty-two (37,3%) patients were admitted to the ICU. The number of patients treated in the first year of the study period (July 2004-June 2005) was nine. During the second year (July 2005-June 2006) eleven patients were treated, in the third year

(July 2006-June 2007) eighteen patients and in the fourth year (July 2007-June 2008) twenty-one patients were admitted. The average admission time was 8,3 days (range 0-71). Of the patients with a shotwound 25% died of their injuries and mortality rate of the patients with a stabwound was 10.7%. In the last year of the study period the mortality of gunshot wounds was 9.5%.

Conclusion: There is an increase in incidence of penetrating injury of the thorax for both stabwounds and gunshot wounds. The increase of gunshot wounds was especially large in the period July 2007- June 2008. The risk of suffering a gunshot or stabwound to the chest in our traumaregion is gender related. With the increase in the number of gunshot wounds, and thus experience, the mortality seems to decrease.

Disclosure: No significant relationships.

S045 Fixation of Rib Fractures and Flail Chest: Short-Term Results of a Pilot Study Using the New Matrix[®] Rib Fixation System

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Introduction: Rib fractures and more specific the flail chest are currently treated conservative. In our level one trauma centre we have on average 90 patients with rib fractures and 5 flail chests/yr. Until recently we mainly treated the patients conservative. According to the literature the morbidity and mortality increases twofold with 4 or more ipsilateral rib fractures and an age > 45yrs old.^{1,2} Some studies have also shown that operative fixation of rib fractures may reduce the morbidity significantly.³ With this data and the recent development of specific dedicated osteosynthesis material for rib fractures we devised a pilot study in order to analyse the efficacy of this new Matrix[®] Rib fixation System (Synthes[®]) and the effect on the morbidity/mortality of the patient.

Material and Methods: During a 6 month period we included all patients with the before mentioned criteria (4 rib fractures, > 45 yr) or with a flail chest. We analysed operation details, length of ICU stay, hospital stay and recorded complications. The results were compared with a matched control group from 2008.

Results: 12 patients were included with an average age of 59 yrs and a M:F distribution of 9:3. 5 patients had a flail chest and 7 patients had 4 or more rib fractures. On average all patients were operated within 2 days (0-5). On average 4 (2-6) rib were stabilized with an operating time of 77 min (40-150). No implant failures were seen. 8 patients had an average ICU stay of 8 days (3-19). Total hospital stay for the whole group was 18 days (6-38), specific for flail chest it was 22 days and for the ipsilateral rib fractures it was 16 days. One patient sustained an extra rib fracture due to the procedure and one patient sustained an iatrogenic pneumothorax. One patient died due to neurologic complications. One patient had a superficial wound infection. No deep infections, pneumonia or chest related mortality occurred. Compared to a matched control group of 2008, the overall length of stay was not significantly different. 18 vs 15 days. The length of stay for the ipsilateral fractures was not significantly shorter, 16 vs 15. However the length of stay for the flail chest was significantly shorter in the study group 22 vs 48 ($P < 0.05$). The control group had significant more pneumonia, 5 vs 1 ($P < 0.05$).

Conclusion: The new Matrix[®] system is easy and safe to work with. The system has good stabilizing capabilities. Operative treatment reduces pneumonia and length of stay with flail chest. These results

warrant a randomised study, comparing operative treatment vs conservative treatment.

References: 1. Kent et al. Annu Proc Assoc Adv Automot Med. 2008 Fatality risk and the presence of rib fractures. 2. Moore et al. The American Journal of Surgery 2006. A multidisciplinary clinical pathway decreases rib fracture-associated 3. Tanaka et al. J Trauma 2002. Surgical stabilization or internal pneumatic stabilization

Disclosure: No significant relationships.

S046 Primary Fixation of Severe Thoracic Wall Fractures: Does it Shorten Ventilatory Time?

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Introduction: Severe thoracic wall injuries can result in long time ICU stay with ventilatory support substantial morbidity and even death. If the patient recovers persistent thoracic wall pain, restricted respiratory capacity and/or non union of the rib fractures can be the consequence. In a systematic review of literature we demonstrated that there is some evidence that early internal fixation can shorten the on-ventilator time, the ICU stay and lower the short time morbidity. Long term pulmonary function is not altered by internal fixation, however the rate of rib nonunion and chest wall pain is decreased. However high quality evidence is lacking. In order to evaluate the feasibility of rib osteosynthesis with a new plating system: the Synthes Matrix System a preliminary study is performed and its results presented. This study precedes a randomised controlled trial comparing plate and screw osteosynthesis and conservative treatment.

Material and Methods: 10 Consecutive patients with flail chest and or serial rib fractures involving at least five ribs necessitating measures other than analgetics to maintain pulmonary function are included and prospectively documented. Exclusion criteria: *hemodynamic instability necessitating a damage control approach *intrathoracic injuries necessitating surgery *normal pulmonary function *patient refusing surgical treatment *patient not available for follow-up All patients are operated upon with use of the Matrix-rib system. Postoperative ICU stay, on-respirator time, pain at defined moments of follow-up, healing of the rib fractures and complications are recorded prospectively. Patients grade their rate of satisfaction (functional and esthetical) on a scale of 0 to 10. The results in these patients concerning on-ventilator time, ICU stay and morbidity are compared to a historical series of patients with comparable ISS. Prospective case series with historical control group. (Level III)

Results: Preliminary data indicate: *a shorter time on ventilator than anticipated (based on comparison to historical data) * a shorter time on ICU * less pneumoniae * no intra-operative complications * good healing results of the rib fractures * no implant failures * acceptable pain scores * good overall satisfaction * acceptable cosmetic results

Conclusion: Internal fixation of rib fractures (flail chest or multiple sequential fractures with pulmonary function compromise) results in a earlier recuperation of pulmonary function with shortened ICU

stay. The overall satisfaction of the patient after operative treatment is good, with acceptable cosmetic results. There were no implant related complications. These results form the basis for a randomised control trial comparing operative fixation with the Matrix rib system to conservative treatment.

Disclosure: No significant relationships.

S047 Tracheobronchial Stenting Under Local Anesthesia for Acute Airway Emergencies

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Introduction: Acute airway emergencies result from a wide variety of malignant and benign diseases. For both the patient and the clinician, the presentation can be frightening, and advanced interventional pulmonary/endobronchial techniques are required to achieve prompt relief of symptoms. General anesthesia is sometimes prohibited in these situations with complete loss of airway. We report our initial experience with these patients in a tertiary referral center.

Material and Methods: Three patients (two males) with acute proximal airway emergencies were included. Two patients presented with acute stridor. The third presented with massive bronchial air leak and purulent drainage after an acute traumatic event. All patients were treated emergently with bronchoscopy and placement of an ultraflex bronchial stent under local anesthesia. All patients were followed up after discharge.

Results: There was no perioperative mortality or morbidity. The median age was 51. One patient had anaplastic thyroid cancer obstructing the trachea and was denied treatment elsewhere. The second patient had a malignant tracheoesophageal fistula. The third patient had an acute bronchopleural fistula following pneumonectomy for a gunshot wound. Complete symptom relief was obtained after stenting under local anesthesia in all patients. Median length of stay was 3 days for the patients with malignancy. On a median follow up of 11 months; Two patients were symptom free, One patient died from malignant disease progression.

Conclusion: Stenting under local anesthesia is feasible with acute airway emergency. Obstruction of the central airways by malignant tumor is associated with poor prognosis. The alleviation of central airway obstruction by tumor is most often palliative, with improvement of quality of life the primary goal rather than cure.

References: Emergent management of malignancy-related acute airway obstruction. Theodore PR. Emerg Med Clin North Am. 2009 May;27(2):231-41. Review.PMID: 19447308 [PubMed - indexed for MEDLINE]Related articles Tracheal amyloidosis-an unusual cause of stridor. Lang EE, Phelan E, Rowley H. Ear Nose Throat J. 2009 May;88(5):E27.PMID: 19444779 [PubMed - indexed for MEDLINE]Related articles Metallic stents for rescuing a patient with severe upper airway compression due to aortic aneurysm. Chen WC, Tu CY, Liang SJ, Liu JC, Chen W.

Disclosure: No significant relationships.

DISASTER & MILITARY SURGERY**S048 Field Hospital Strategies in the Abruzzo Earthquake of 2009***M. Esposito¹, S. Balducci², C. Antinori³*¹Civil Protection, ARES, Ancona, Italy., Polverigi, Italy,²Regional Civil Protection of Marche, Regional Civil Protection of Marche, Ancona, Italy,³Sciences Faculty, Marche Polytechnic University, Ancona, Italy, Ancona, Italy

Introduction: On April 6th 2009 an earthquake measuring 6.3 on the Richter Scale struck a large area of the Abruzzo region in central Italy. The first notice suggested a lot of injured people and destroyed structures, included the main hospital of the area, the San Salvatore Hospital.

Material and Methods: The National Civil Protection immediately send the field hospital (FH) of the Marche Regional Government, the neighbouring region, together with a large amount of medical staff and personnel by the non governmental organization ARES (Regional Association Sanitary Emergencies). This association, already involved during other national and international disaster situations and relief efforts, sent professionals volunteers (MD and nurses) with disaster knowledge and specific medical specializations. The international literature demonstrated that a FH is a complex structure and often the time required to be completely functionally is very long, indeed longer than the affected people needs.

Results: From April 6th, June 6th when the mission ended, the FH provided medical treated to almost 6000 patients, and the ARES personnel (167) were backed by the sanitary personnel of the San Salvatore Hospital.

Conclusion: A well planned medical response is very important to provide health assistance during a disaster, yet it is very hard to substitute a damaged hospital in the heart of the disaster area. A modular sanitary structure, very light at the beginning, with specific and restricted medical supplies, with a little number of specialists in disaster medicine and disaster logistics, could improve the already good results obtained in the L'Aquila Abruzzo mission.

Disclosure: No significant relationships.

S049 Train Crash – EMS Response*R. Gregor, D. Holes¹*¹EMS, Territorial Rescue Centre of Moravian-Silesian Region, Ostrava – Zabreh, Czech Republic

Introduction: August 8, 2008 at 10:30 AM - the EC Comenius crashes into a collapsing bridge at a speed of about 90 km/h (approx 56 MPH).

Material and Methods: This presentation is first of couple ones (presented by our clinical colleagues) and describing response of EMS, HEMS, Emergency department of Trauma Centre and other hospitals to the train crash.

Results: 41 patients were triaged - Group I (immediate therapy) 9, Group II (immediate transport) 15, Group III (light injuries) 11, Group IV (fatalities) 6. Several lightly injured patients were transported to hospitals bypassing triage. Total number of patients admitted to hospitals was 67. 12:20 EMS doctor with fire brigade crew searches all damaged cars and labels 6 victims as dead. At 12:25 Last

patients from site transported to Trauma Centre, at 12:31 last patient was transported from scene. Time between bridges collapsing to last patient transported – 2 h.

Permanent communication with Press & Media was performed, press conference on site was held. Medical intervention finishes with examination of last victim and all documentation passed over to the Police (18:30). EMS management team relocated to CDC, final press release was made at 23:50.

Conclusion: There were excellent cooperation of all organizations in Integrated Rescue System. Last injured patient was transported to hospital 2 h after accident. Also there was great back-up support from fire brigade (mobile DC, tents, containers, drink and catering for responding staff. Lessons learned- tens of people – lightly or uninjured escaped from scene before police cordoned off scene, unfortunately no possibility to use dedicated digital PMR (all equipment were stored at Police dept. for obligatory FW upgrade of security of codes). Unstable communication via cell phones – overload of local BTS and infrastructure.

Disclosure: No significant relationships.

S050 The Pakistan Earthquake of 2005: Italian Field Hospital Medical Response*M. Caroli¹, T. Ordonselli², M. Esposito³*¹Ospedali Riuniti Ancona, MCAU, Ancona, Italy,²Mcau, O.C FANO, Fano, Italy,³Civil Protection, ARES, Ancona, Italy, Polverigi, Italy

Introduction: At 08.50 h on 8 October 2005, an earthquake measuring 7.6 on the Richter scale devastated a large area of Northern Pakistan (Kashmir). The earthquake caused massive devastation: around 100,000 people died, twice as many were injured, and almost 3million people were made homeless. In any situation of disaster, both natural and complex, may be produced a large number of victims that defeat the ability of local health resources to provide adequate health care. On one hand, the system may be overwhelmed with a high number of casualties. On the other hand, hospitals and other health care facilities generally may be compromised heavily: buildings may be destroyed or damaged and the supply of water, electricity, medical gasses, etc. may be limited. The transportation infrastructures may be severely damaged, creating problems for both people and equipment arriving at the hospital. Damage to the health care infrastructure will further compromise the delivery of health services.

Material and Methods: Italian Government responded immediately to this emergency after the official request for international relief efforts from the President of Pakistan. Two days after the impact, the first Italian evaluation emergency team was already arrived in Pakistan and the initial field structure was already fully operative, offering medical care, especially advanced trauma care and life support intervention, provided by specialists. Later, when the structure had been completed and became larger provided also hospitalization, and surgical abilities, appropriate treatments and essential drugs. All the medical activities of the responding Italian mission team field hospital in Manshera were recorded and evaluated.

Results: A total of 20,212 patient contacts occurred at the field hospital during the 83 days it operated, 620 patients were admitted in the field hospital with a total number of 6949 nursing days with a average length of stay per admission of 11,2 days and with the occupancy rate of 95,2%. A total number of 365 major operations were performed.

Conclusion: Although exact data regarding local medical systems and population health status pre-event are lacking, the data show that a well-constructed, multidisciplinary, field hospital oriented for an array of different medical problems fills the gap in the medical system created by the damage to the medical infrastructure. We appreciate the nurses, paramedics, medics, translators, and logistical personnel for their great contributions.

References: Guidelines for the use of Foreign Field Hospitals in the Aftermath of Sudden-Impact Disaster. Department of Emergency and Humanitarian Action, the World Health Organization; area on Emergency Preparedness and disaster relief, the Pan-American Health Organization. Roy N, Shah H, Patel V, Coughlin RR: The Gujarat Earthquake (2001) experience in a seismically unprepared area: community hospital medical response. *Prehosp Disast Med* 2002;17(4):186-195.

Disclosure: No significant relationships.

S051 French Experience of Mass Casualties in Afghanistan

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Introduction: Mass casualty incident's (MCI) management is a present problem which is now more frequent because of Iraqi, Afghan wars and terrorists actions. Numerous new plans are evolved in each emergency association or military organization. NATO as built a "MASSCAL" plan to help teams in role II in Afghanistan to take care MCI. Through two experiences of MCI in French Role II in Afghanistan (Kaboul) and through the litterature, we discuss the different ways of taking in charge MCI.

Material and Methods: The french role II is located in Kaboul near helicopter area. There are 3 surgical teams (50 pax, 3 nationalities), 3 emergencies boxes, 4 ICU beds and 3 operating theatres. We have a pool of 42 blood units, an echograph, a first generation CT-scan and all materials for traumatologic surgery.

For MCI, we use NATO triage classification. Each trauma undergoes resuscitation room, has needing X-Ray exams, FAST echography and intensive care if necessary. Patient who needs urgent surgery runs immediately to operating theatre. ISS score is calculated.

The first MCI concerns 6 patients involved in a suicid bomber's explosion near the role II. All were taken in charge 15 min later.

The second concerns an attack against a French Coy occurred 50 km in the East of Kaboul. There were 22 casualties and 10 soldiers died. They were taken in charge belatedly between 7 to 12 h later.

Results: First MCI : 4 surgical interventions, one 90% burned, and a blast injury. Second MCI : 7 surgical interventions, 15 injuries with no surgery, 6 blast injuries. We organize for these second MCI a STRATEVAC in France for 10 casualties in less than 24 h.

Mean ISS score is 8 for alive injuries and 40 for the died soldiers.

Through these 2 MCI, we analyse the litterature and discuss about presents concepts in MCI management.

Conclusion: The contemporary history of war, especially in Iraqi and Afghanistan constrains military surgical teams to improve their way of management of MCI. Training is necessary. First of all we have to define clearly each place of each actor, the conditions of triage, with priority for which surgery and the possibility of modern communications and fast and efficient transports.

References: 1-Nessen and al, *J Trauma* 2009;66:S37-47

2-Propper and al, *Ann Surg* 2009;250:311-5

3-Beekley and al, *J Trauma* 2009;66:S129-37

4-Beekley and al, *J Trauma* 2007;62:S39-40

5-Beekley and al, *Surg Clin North Am* 2007;87:157-84

6-Chambers and al, *J Trauma* 2006;60:1155-61

7-David and al, *J Trauma* 2006;61:943-8

8-Eastridge and al, *J Trauma* 2006;61:820-3

9-Lynn and al, *J Burn Care Res* 2006;27:649-58

10-Hirshberg and al, *J Trauma* 2005;58:686-93

11-Grissom and al, *Crit Care Med* 2005;33:S13-21

12-Einav and al, *Ann Surg* 2004;239:304-10

13-Frykberg ER, *J Trauma* 2002;53:201-12

Disclosure: No significant relationships.

S052 Reports From Afghanistan (Operation Enduring Freedom And ISAF): The Dutch Experience

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Introduction: The Central Military Hospital (CMH) in Utrecht is the only military hospital in the Netherlands. In collaboration with the University Medical Center Utrecht it is the first hospital outside the combat zone providing care to the Dutch wartime sick and wounded. The intent of this study was to get an overview of the repatriated soldiers from Operation Enduring Freedom and ISAF (International Security Assistance Force) in Afghanistan. About 2000 Dutch service members are continuously deployed in Afghanistan. Since the beginning of the Dutch involvement in this operation 21 soldiers lost there lives in Afghanistan.

Design: Descriptive epidemiologic study.

Material and Methods: The archive of the CMH was queried for all Dutch service members receiving treatment for wounds or diseases sustained in Operation Enduring Freedom and ISAF in Afghanistan from may 2005 through September 2009.

Results: As of May 2005 the personnel of the Central Military Hospital and the University Medical Center have treated 104 patients (4 women, 100 men) from Operation Enduring Freedom and ISAF in Afghanistan. 68 of them were repatriated because of battle injuries. Their mean age was 27. Of these 68 patients most injuries involved

the lower extremity (38%). 19% suffered multiple severe injuries, 9% upper extremity injury, 7% upper extremity and head/neck injury, 7% back injury, 6% head/neck injury, 6% upper and lower extremity injury, 4% abdominal injury and 4% miscellaneous. 7 patients (10%) underwent a primary amputation of one or more extremities. 3 (4%) patients underwent secondary amputation. All primary amputated limbs were shortened later. 1 patient (1%) died one day after arrival in the CMH because of multiple severe injuries. **Conclusion:** This single-center, and therefore complete dataset of the repatriated military personnel demonstrates the impact of participating in a NATO mission for a small European country. It puts a high and challenging burden on the shoulders of the medical personnel in our hospital. Further it shows, in contrast to studies from Owens and Dougherty, a higher prevalence of lower extremity injuries than upper extremity injuries. Data regarding admission time, infection rate, disposition and quality of life will be presented.

References: Combat wounds in operation Iraqi Freedom and operation Enduring Freedom. Owens BD, Kragh JF Jr, Wenke JC, Macaitis J, Wade CE, Holcomb JB. *J Trauma*. 2008 Feb;64(2):295-9. Battlefield extremity injuries in Operation Iraqi Freedom. Dougherty AL, Mohrle CR, Galarneau MR, Woodruff SI, Dye JL, Quinn KH. *Injury*. 2009 Jul;40(7):772-7. Epub 2009 May 18.

Disclosure: No significant relationships.

S053 War surgery in Afghanistan

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Introduction: As military surgeon I have done tours in Kandahar and Tarin Kowt in Afghanistan and in As Shamawah in Irak. In Afghanistan I have seen a lot of war related wounds and done war-surgery. From what is learned in war surgery can be of value for other people. This can be medical, but humanitarian also.

Material and Methods: From August 28 till November 1 in 2007 and from March 23 till June 5 2009 I have been in Afghanistan as military surgeon. During that time I have done 157 operations 99% war related. These operations varied from amputations, external fixators to laparotomies and thoracotomies. Sometimes there were miscalculations in with I had the role of medical coordinator.

Results: The experiences as war surgeon are intense. You have to deal with very seriously wounded patients. Sometimes there are more patients at the same time. Another problem is the limited resources. A lot of medical-ethical decisions had to be made about continuation of medical treatment or to decide which patient will be treated and with patient will not be treated. As war surgeon you have to do operation for which you were not educated. Because there is no other surgeon you have to the operation or the patient will die. It gives the opportunity to learn and gives a lot of surgical experience. This can be useful in civilian circumstances also.

Conclusion: The period as war surgeon in Afghanistan has been of a force impact. I had to take a lot of medical-ethical decisions and to do operations in which I was not trained. But I have learned a lot about war surgery and on human aspects also.

References: S.Ch. Nessen, D.E. Lounsbury, S.P. Hetz (edit). War surgery in Afghanistan and Iraq. Government Printing Office, Washington 2008.

Disclosure: No significant relationships.

S054 An Evaluation of Two Surgical Team Operations in a Level II Hospital in Afghanistan

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Introduction: There are a lot of unique challenges for the medical personnel which are assigned to the combat environment in Afghanistan. Especially the medical groups are in contact with patients from different nationalities and with different characteristics under special and difficult war circumstances. This article evaluates the effectiveness of the co-operation between a German and a Greek surgical team during a 2-month period in a level II hospital in North Afghanistan.

Material and Methods: From 21st July 2009 through 20th September 2009, 764 patients were admitted. There were 718 male (94%) and 46 female (6%). We reviewed the type of diseases, mechanism and location of injuries, management, type of surgical procedures performed, blood supply and outcome.

Results: 72.9% of the patients were International Security Assistance Force (ISAF) personnel. Most of the patients were men in a percentage of 94%. Four children were included among the local patients. 37.6% of the patients had surgical diseases while the rest 28.9% were of orthopaedic interest patients. 35 (4.6%) patients underwent a surgical operation; 26 (74.3%) of them were operated immediately. Gunshots were the main mechanism of injury for local patients whereas ISAF personnel were usually presented with burns after improvised explosive devices (IEDs) and rocket attacks.

Conclusion: The co-operation between medical teams from different countries, when appropriately trained, staffed, and equipped, can be highly effective in order to manage war casualties.

References: 1. Borders R. Provincial reconstruction teams in Afghanistan: a model for post-conflict reconstruction and development. *Journal of Development and Social Transformation* 2004; 1: 5-12.

2. McNerney MJ. Stabilization and reconstruction in Afghanistan: are PRTs a model or a muddle? *Parameters* Vol. XXXV, No. 4 (Winter 2005-2006), pp. 32-46.

3. Peoples GE, Gerlinger T, Craig R, et al. Combat casualties in Afghanistan cared for by a single forward surgical team during the initial phases of Operation Enduring Freedom. *Mil Med* 2005; 170: 462-468.

4. Owens BD, Kragh JF Jr, Wenke JC, Macaitis J, Wade CE, Holcomb JB. Combat wounds in Operation Iraqi Freedom and Operation Enduring Freedom. *J Trauma* 2008; 64: 295-299.

5. Kauvar DS, Wolf SE, Wade CE, Cancio LC, Renz EM, Holcomb JB. Burns sustained in combat explosions in Operations Iraqi and Enduring Freedom. *Burns* 2006; 32:853-857.

6. Wolf SE, Kauvar DS, Wade CE, et al. Comparison between civilian burns and combat burns from Operation Iraqi Freedom and Operation Enduring Freedom. *Ann Surg* 2006; 243: 786-795.

Disclosure: No significant relationships.

S055 National and International Experiences of ARES: An Italian Specialized Association in Disaster Medicine

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Introduction: In the emergency caused by natural and social disasters there are evident deficits between the health needs of affected population and the local health system capacity. The causes of disasters are various and not predictable, usually the health structures can not face up to the population needs. Knowing that disaster medicine has different protocols and materials from ordinary medicine structures and that improvisation during the disaster's acute phases is not a good practice, it has been created an emergency operating health group, the non-profit ARES Association. (Regional Association Sanitary Emergencies)

Material and Methods: The ARES, whose members are about 600, all over the nation, is configured as an extraordinary health resource, activated by the National Civil Defence operations centre, in according with the Regional centre of Marche, in disaster situations

Results: The main objectives of ARES are training and organization of medical staff and structures and its growth crosses several missions including: · Earthquake in Molise, 2002. · Tsunami in Thailand, December 2004. The ARES was the first Italian medical team which intervened. · Earthquake of magnitude 7.6, in Pakistan October 2005. Earthquake in Indonesia, May 2006.

Conclusion: The main objectives of ARES are training and organization of medical staff and structures and its growth crosses several missions including: · Earthquake in Molise, 2002. · Tsunami in Thailand, December 2004. · Earthquake of magnitude 7.6, in Pakistan October 2005. · Earthquake in Indonesia, May 2006.

Disclosure: No significant relationships.

BIOMECHANICS

S056 A Biomechanical Comparison of Static Versus Dynamic Lag Screw Modes for Cephalomedullary Nails Used to Fix Unstable Peritrochanteric Fractures

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Introduction: Cephalomedullary nails rely on a large lag screw that provides fixation into the femoral head. There is an option to statically lock the lag screw (static mode) or to allow the lag screw to move within the nail to compress the intertrochanteric fracture (dynamic mode). The purpose of this study was to compare the biomechanical stiffness of static and dynamic modes for a cephalomedullary nail used to fix an unstable peritrochanteric fracture.

Material and Methods: Thirty intact synthetic femur specimens (Model #3406, Pacific Research Laboratories, Vashon, WA) were potted into cement blocks distally for testing on an Instron 8874 (Instron, Canton, MA). A long cephalomedullary nail (Long Gamma 3 Nail, Stryker, Mahwah, NJ) was then inserted into each of the femurs. An unstable four-part fracture was created, anatomically reduced, and the cephalomedullary nail was reinserted. Mechanical tests were conducted for axial, lateral, and torsional stiffness with the lag screws in: 1) static and 2) dynamic modes. A paired student's t-test was used to compare the two modes.

Results: The axial stiffness of the cephalomedullary nail was significantly greater ($p < 0.01$) in the static mode (484.3 ± 80.2 N/mm) than in the dynamic mode (424.1 ± 78.0 N/mm) (fig 2A). Similarly, the lateral bending stiffness of the nail was significantly greater ($p < 0.01$) in the static mode (113.9 ± 8.4 N/mm) than the dynamic mode (109.5 ± 8.8 N/mm). The torsional stiffness of the nail was significantly greater ($p = 0.02$) in the dynamic mode (114.5 ± 28.2 N/mm) than in the static mode (111.7 ± 27.0 N/mm). A post hoc power analysis with $\alpha = 0.05$ and $\beta = 0.20$ revealed that the paired t-test on 30 samples was sufficiently powered to determine a difference in mean axial stiffness of 33.0 N/mm (6.8% of static stiffness), a difference in mean lateral bending stiffness of 3.6 N/mm (3.2% of static stiffness) and a difference in mean torsional stiffness of 3.4 N/mm (3.0% of static stiffness).

Conclusion: Our results show that there is a 60 N/mm reduction in axial stiffness of the cephalomedullary nail when the lag screw is changed from static to dynamic mode. This represents a 12.4% reduction in axial stiffness with a change from axial to dynamic modes which may be clinically significant. The differences in lateral (4.4 N/mm, 3.9%) and torsional (2.8 N/mm, 2.4%) are small enough that they are likely not clinically significant. We felt that a difference of greater than 10% in axial stiffness and a difference of greater than 5% in lateral or torsional stiffness would be clinically significant. Our study was adequately powered to detect these differences. Given the significant reduction in axial stiffness with dynamization of the cephalomedullary nail construct, we recommend use of the static mode when treating unstable peritrochanteric fractures with a cephalomedullary nail.

Disclosure: No significant relationships.

S057 A Biomechanical Analysis of Lag Screw Position in the Femoral Head for Cephalomedullary Nails Used to Fix Unstable Peritrochanteric Fractures

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Introduction: Minimizing tip-apex distance has been shown to reduce clinical failure of sliding hip screws used to fix peritrochanteric fractures. The purpose of this study was to determine if such a relationship exists for the position of the lag screw in the femoral head using a cephalomedullary device.

Material and Methods: Thirty intact synthetic femur specimens (Model #3406, Pacific Research Laboratories, Vashon, WA) were potted into cement blocks distally for testing on an Instron 8874 (Instron, Canton, MA). A long cephalomedullary nail (Long Gamma 3 Nail, Stryker, Mahwah, NJ) was inserted into each of the femurs. An unstable four-part fracture was created, anatomically reduced, and repaired using one of 5 lag screw placements in the femoral head: 1) Superior (N = 6), 2) Inferior (N = 6), 3) Anterior (N = 6), 4) Posterior (N = 6), 5) Central (N = 6). Mechanical tests were repeated for axial, lateral and torsional stiffness. All specimens were radiographed in the anteroposterior and lateral planes and tip-apex (TAD) distance was calculated. A calcar referenced tip-apex distance (CalTAD) was also calculated. ANOVA was used to compare means of the five treatment groups. Linear regression analysis was used to compare axial, lateral and torsional stiffness (dependent variables) to both TAD and CalTAD (independent variables).

Results: ANOVA testing proved that the mean axial ($p < 0.01$) and torsional stiffness ($p < 0.01$) between the five groups was significantly different, but lateral stiffness was not statistically different ($p = 0.494$). Post hoc analysis showed that the inferior lag screw position provided significantly higher mean axial stiffness (568.14 ± 66.9 N/mm) than superior (428.0 ± 45.6 N/mm; $p < 0.01$), anterior (443.2 ± 45.4 N/mm; $p = 0.02$) and posterior (456.7 ± 69.3 N/mm; $p = 0.04$) lag screw positions. There was no significant difference in mean axial stiffness between inferior (568.14 ± 66.9 N/mm) and central (525.4 ± 81.7 N/mm) lag screw positions ($p = 0.77$). Post hoc analysis revealed significantly less mean torsional stiffness for the superior lag screw position compared to other lag screw positions ($p < 0.01$ all 4 pairings). There were no significant correlations between TAD and axial ($r = -0.33$, $p = 0.08$), lateral ($r = -0.22$, $p = 0.24$) or torsional ($r = 0.08$, $p = 0.69$) stiffness. There were significant correlations between CalTAD and axial ($r = -0.66$, $p < 0.01$), lateral ($r = -0.38$, $p = 0.04$) and torsional ($r = -0.38$, $p = 0.04$) stiffness.

Conclusion: Our results suggest that placement of the lag screw inferiorly in the femoral head when using a cephalomedullary nail to treat an unstable peritrochanteric fracture results in the stiffest construct in axial and torsional biomechanical testing. A simple radiographic measurement, CalTAD, provides an intraoperative method of determining optimal cephalomedullary nail lag screw position to achieve greatest construct stiffness.

Disclosure: No significant relationships.

S058 Is it of Any Benefit to Rotationally Lock the Dynamic Hips Screw, or the Use of a Second So-called Anti-rotation Screw: A Prospective Clinical Study of 372 Unstable AO/OTA 31 A-2 And A-3 Pertrochanteric Fractures Treated by Means of the GT Intramedullary Nail, with a Single 9-mm Diameter Rotationally Unlocked Hip Screw

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Introduction: No clinical or biomechanical published paper have shown the benefits of rotationally lock the dynamic hip screw, or the use of an accessory screw called "anti-rotation screw". Eastwood and Miles (Mars. 2004) showed in a dynamic biomechanical study that the side-plates with a non locked rotationally hip screw slid better than the rotationally locked screws and furthermore, the system do not showed deleterious effects in terms of bone fragments compression. On April 2004, we designed a prospective clinical study to treat the unstable AO/OTA 31 A-2 and A-3 pertrochanteric fractures with a single rotationally unlocked hip screw.

Material and Methods: 370 patients (87.9% women). Average age 87.5 years, range (74-101 year), 305, 31 A-2 fractures (two with bilateral hip fractures), 67, 31 A-3 fractures, were treated with the GT trochanteric nail (Surgival-Valencia), with a single rotationally unlocked 9-mm hip screw, and followed more than six months. A distal diaphyseal locking screw of 4.5 mm was only and always placed in the 31 A-3 fractures. Radiological AP and L pictures were obtained intraop-the day before chek-out-1-3-6-12 months postop. On the X-Ray pictures we studied: Screw-tip migration (Doppelt's method). Tip-apex distance (Baumgaertner's Method). Hip-screw sliding. Measured with the appropriate corrections for X-R magnification.

Results: Screw-tip migration: < than 2 mm in 248 fx (66.6%). Average 2.5 mm. Range (0 mm-9.4 mm). TAD: < than 25 mm in 318 cases (85.4%). Hip-screw sliding: Average 6.7 mm. Range (1.4 mm-10.1) No deep infections. No screw cutting-out All the fractures but 9 (2.4%), healed uneventfully. Seven 31 A-2 fractures had problems: 1 malreduced fracture. In 5 fractures the screw slid backwards. In one case a protruding screw was removed after bone healing. Two complications (2.9%) occurred in the 31 A-3 fractures. A fracture of the femoral diaphysis at the level of the distal dynamic locking screw, due to a missing drilling of the hole; a long nail was reinserted, and a broken dynamic hip screw.

Conclusion: A single 9-mm diameter rotationally unlocked dynamic hip screw yields excellent results in terms of healing, providing that the fracture has been reduced in an acceptable position in both planes, and the dynamic hip screw has been place in the lower half or in the center of the neck in the AP view, and in the center or in the posterior half of the head in the lateral view. Our prospective study shows excellent results in terms of healing of the AO/OTA 31 A-2 and A-3 fractures treated in this way.

References: Eastwood- Miles. Poster presentation Mars 2004. AAOS Wang CJ, Wu C-C Shih C-H, Lee M-Y and Tai C.

Disclosure: The only author that gets consultancy services and "royalties" from the manufacturer enterprise Surgival is the presenter A. Peinado MD

S059 Biomechanical Testing of Polymethylmethacrylate Augmented Perforated PFNA® Helical Blades in Surrogate Femoral Heads: An In vitro Study

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Introduction: Helically shaped cephalic implants have proven their benefit to achieve a better stabilization for the treatment of unstable intertrochanteric hip fractures, although cut-out ratios up to 3.6% still occur¹⁻⁴. This study compares the biomechanical stability of polymethylmethacrylate (PMMA) augmented proximal femoral nail antirotational (PFNA) blades in surrogate femoral heads to non-augmented blades concerning cut-out and head rotation.

Material and Methods: 24 surrogate femoral heads were instrumented with a PFNA blade in a standardized manner. Four study groups of 6 samples were formed with central and off-center implantation in an augmented and non-augmented fashion. Cyclic loading was performed at 2 Hz. Starting at 1000 N, the load was monotonically increasing by 0.1 N/cycle until failure of the construct. Movement of the head was identified by means of optical motion tracking. Multiple Mann-Whitney U tests were performed on the cycles until failure for pairwise comparisons between study groups.

Results: Augmented samples clearly showed an increased number of cycles to failure compared to their control (all $p = 0.012$). In the groups with centric position of the PFNA blade, augmentation led to an increase of the failure load by 100%. In the groups with off-centric positioning of the blade, the peak load was even increased by 150% as a result of augmentation.

Conclusion: The results of this in vitro study suggest that cement augmentation of the PFNA blade clearly enhances the biomechanical stability under cyclic loading, even in case of suboptimal positioning of the implant. Mal-placement however, affects the implant purchase with or without augmentation.

References: 1. Windolf M, Muths R, Braunstein V, Gueorguiev B, Hanni M, Schwieger K. Quantification of cancellous bone-compaction due to DHS Blade insertion and influence upon cut-out resistance. Clin Biomech (Bristol, Avon). 2009;24:53-58. 2. Windolf M, Braunstein V, Dutoit C, Schwieger K. Is a helical shaped implant a superior alternative to the Dynamic Hip Screw for unstable femoral neck fractures? A biomechanical investigation. Clin Biomech (Bristol, Avon). 2009;24:59-64. 3. Simmermacher RK, Bosch AM, Van der WC. The AO/ASIF-proximal femoral nail (PFN): a new device for the treatment of unstable proximal femoral fractures. Injury. 1999;30:327-332. 4. Mereddy P, Kamath S, Ramakrishnan M, Malik H, Donnachie N. The AO/ASIF proximal femoral nail antirotation (PFNA): a new design for the treatment of unstable proximal femoral fractures. Injury. 2009;40:428-432.

Disclosure: No significant relationships.

S060 Potential of Cement Augmentation of PFNA® Blades with Regard to Cut-out Resistance: Human Cadaveric Test

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Introduction: A potential of polymethylmethacrylate (PMMA) augmentation to increase the purchase of cephalic implants in the treatment of intertrochanteric hip fractures has been proven in sev-

eral biomechanical studies¹⁻⁴. The aim of this study is to compare the cut-out ratio of PMMA augmented helical blades to not augmented ones in human cadaveric femoral heads.

Material and Methods: Six pairs of osteoporotic cadaveric femoral heads were instrumented with a proximal femoral nail antirotational (PFNA) blade in a standardized manner. Within each pair, one blade was augmented using 3 ml of PMMA cement. Cyclic loading was performed at 2 Hz. Starting at 1000 N, the load was monotonically increasing by 0.1 N/cycle until failure of the construct. X-rays were taken at 250 cycle increments to monitor the movement of the blade with respect to the head. Paired non-parametric test statistics were used to identify differences between groups.

Results: A significant higher number of cycles to cut-out was found for the augmented group ($p = 0.028$). A significant correlation was observed between bone mineral density and cycles to cut-out for the non-augmented specimens ($p < 0.001$, $R^2 = 0.97$), whereas no correlation was found for the augmented group ($p = 0.4$, $R^2 = 0.18$).

Conclusion: Augmentation improves implant purchase and can be valuable in cases of osteoporotic bone. Indications should be clearly stated because the influence of augmentation on normal bone is of minor value. Further evaluation of possible risks (leakage into joint or fracture site, thermal damage) needs to be done. However, from a biomechanical perspective the technique seems to provide a feasible improvement of implant purchase in osteoporotic bone.

References: 1. Augat P, Rapp S, Claes L. A modified hip screw incorporating injected cement for the fixation of osteoporotic trochanteric fractures. J Orthop Trauma. 2002;16:311-316. 2. Bartucci EJ, Gonzalez MH, Cooperman DR, Freedberg HI, Barmada R, Laros GS. The effect of adjunctive methylmethacrylate on failures of fixation and function in patients with intertrochanteric fractures and osteoporosis. J Bone Joint Surg Am. 1985;67:1094-1107. 3. Szpalski M, Descamps PY, Hayez JP et al. Prevention of hip lag screw cut-out by cement augmentation: description of a new technique and preliminary clinical results. J Orthop Trauma. 2004;18:34-40. 4. von der Linden P, Gisev A, Boner V, Windolf M, Appelt A, Suhm N. Biomechanical evaluation of a new augmentation method for enhanced screw fixation in osteoporotic proximal femoral fractures. J Orthop Res. 2006;24:2230-2237.

Disclosure: No significant relationships.

S061 Biomechanical Aspects of the Compression Osteosynthesis for Fractures below the Knee Joint

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Introduction: The aim of the work is to study the possibilities of the external fixating device and one-side dynamic compression device when treating for infra-joint fractures of the knee-joint.

Material and Methods: The endurance qualities of the "limb-external fixer" have been studied experimentally in the clinics when treating

condyle fractures of femoral bone and tibia. The experiment have been carried out with the complex “femoral- knee joint- leg” within 2-3 days. The fractures were imitated with transverse cut of condyles, then fragments were matched and fixed with prop spokes. The latter were fixed in the special compression device, set on the external support (Ilizarov frame arch). The osteosynthesis endurance tests were carried out on the diffuse apparatus P-10 and the strength necessary for shift when winding was determined with the help of specially made dynamometrical key of the clock-type. The optimal size of the compression size when femoral condyle fracture makes $340,6 + 18,3H$, leg- $310,8 + 16,4H$. We used this method when treating 127 patients aging from 18 to 76 y.o. On the second day we began to develop the injured joint function. The pressing of the limb was allowed only after removing the apparatus and x-ray confirmation of the fracture consolidation.

Results: The results and discussion. We have examined the results of 110 patients during 5-10 years after the traumas. Early post – operation movements didn't lead to loosening the system “limb –external fixer”. 93,6% patients showed good anatomic-functional results. The unsatisfactory results were connected with heavy traumas and development of degenerative processes in the joint.

Conclusion: The quantity of results of infra-joint fractures of knee joint depends on the size of the compression strength, its direction, biomechanical and functional possibilities of the external fixating device and healing tasks. Biomechanical research and our clinic observation (115 patients) showed the efficiency of one-sided dynamic compression osteosynthesis method. Estimation of treatment results carried out in 5-10 years after trauma revealed good anatomy and functional results in 92,4% cases.

Disclosure: Colleagues

S062 Locked Unreamed Nailing Versus Conventional Locked Unreamed Nailing of Distal Tibia Fractures. A Biomechanical Comparison

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Introduction: Distal tibia fractures are known to be difficult to stabilize and non unions often occur because of a relative instability of the fragments. Therefore it was of interest if a fracture fixation with a distally angle stable locked unreamed nail is of higher stiffness and less interfragmentary movement than a fixation with a conventionally locked unreamed nail.

Material and Methods: A distally angle stable locked unreamed tibia nail with a diameter of 8.0 mm and a conventionally locked unreamed nail of the same diameter were compared biomechanically for compression and torsional load. The tibiae were osteotomized in the distal intersection between 4/5 and 5/5 with a gap of 10 mm after

instrumentation. For compression force a load of 350 N was applied and for torsion a torque of 0 to 10 Nm and back to 0 over -5 Nm was performed. The stiffness was calculated from the machine datas. Further on the interfragmentary movement was measured with an optoelectronic measurement device.

Results: Under compression and torsional load the stiffness showed no significant differences between the angle stable locked unreamed nail and the conventionally locked unreamed nail. No significant differences were also found considering the interfragmentary movement under compression and torsional load.

Conclusion: The treatment of distal tibia fractures with unreamed and distally angle stable locked nailing shows no benefit considering stiffness and interfragmentary movement versus conventionally locked unreamed nailing.

Disclosure: No significant relationships.

S063 Direct And Indirect Loading Using the Ilizarov External Fixator. A Biomechanical in vitro study

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Introduction: When treating distal tibial deformities or fractures with the Ilizarov external fixator the ankle joint and foot is often trans-fixed within the ring construction. For some patients full weight bearing can only be achieved in assembling a walking device on the distal ring. The biomechanical effect of the indirect loading on the fixator stiffness, the osteotomy and the wire tension is still unknown.

Material and Methods: On the basis of a standardized Ilizarov external fixator (4 rings, 160 mm diameter) with two 1,8 mm wires per ring applied in anatomical position on composite tibiae (3rd Generation Sawbones) direct and indirect loading was analyzed using a universal testing machine (model 10, UTS Germany). A middiaphyseal osteotomy of 3,5 mm was performed. The following parameters were recorded: micromotion at the osteotomy, relative movement between bone and rings, compressive forces at the osteotomy and strain of the wires. Each experimental setup was tested ten times with 100 kg maximal axial loading.

Results: The osteotomy gap closure occurred at 275 N at direct loading and at an average of 730 N at indirect loading. The compressive forces at the osteotomy were almost double as high at direct loading. Regarding the relative motions between rings and bone the amplitude of motion was higher at indirect loading. The stress on the wires was up to four times higher when the walking device was applied on the distal ring for indirect loading.

Conclusion: The indirect loading using a walking device has a substantial influence on the mechanical characteristics of the Ilizarov fixator which determine the biomechanical environment of the osteotomy/fracture. The results showed a higher mechanical load while achieving less compressive forces at the osteotomy. In the need of the walking device we suggest to apply additional half-pins at least in the distal fragment.

Disclosure: No significant relationships.

HIP

S064 Intramedullary Fixation with a Third Generation Nail Versus the Sliding Hip Screw for Trochanteric Hip Fractures: a Randomised Trial of 600 Patients

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Introduction: The Sliding Hip Screw (SHS) is currently the treatment of choice for all trochanteric hip fractures. An alternative treatment is the short femoral nail. Earlier designs of these nails were associated with an increased fracture healing complication rate in comparison to the sliding hip screw. The new designs of nails (third generation nails) may however be as good as or even superior to sliding hip screw fixation.

Material and Methods: We conducted a large randomised trial to compare the Targon Proximal Femoral Nail with the Sliding Hip Screw. Patients with trochanteric hip fractures as per the AO classification (A1-A3) were randomised to either implant. All surgery was supervised by one surgeon. All patients were followed up for a minimum of one year months by a blinded observer.

Results: The mean age was 82 years, range 27 to 104 years), 20% were male. Length of surgery was slightly increased for the nail (44 versus 49 min, $p = 0.0002$). Fluoroscopic screening time was increased in the nail group (0.3 versus 0.6 min, $p < 0.0001$). Intra-operative complications were more common with the nailing. There was no difference in blood transfusion requirement between groups. Postoperatively there was no difference in the occurrence of medical complications or mortality. Deep wound infection requiring removal of the implant occurred in one case in the SHS group. In addition there were three cases of cut-out, three of plate detachment from the femur and one non-union in the SHS group, requiring secondary surgery. There were two complications in the nailed group, one case of cut-out which required secondary surgery and one case of fracture non-union. At follow-up no difference in pain scores was seen but there was a tendency to improved mobility in the nailed group ($p = 0.004$).

Conclusion: These results suggest that with improved designs and surgical technique, the newer versions of short nails for proximal femoral fractures may not suffer from the complications of the earlier short intramedullary nails. Intramedullary fixation can result in a lower re-operation rate and improved mobility in comparison to the sliding hip screw.

Disclosure: The author has received honorarium from commercial companies for giving lectures on different aspects of hip fracture treatment. In addition he has received royalties from B.Braun Ltd related to the design and development of an implant used for hip fracture

S065 Are the Stabilities of an Extramedular (DHS) and an Intramedular (Gamma 3/Pfna) Osteosynthese for the Proximal Femur Comparable? A Biomechanical Test

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Introduction: The number of fractures of the proximal part of the femur will decrease in the next decades. In the literature is an ongoing discussion about the indication of intramedular and extramedular osteosyntheses. The published data of clinical investigations still show a similar complication rate for both techniques (Parker, Cochran 2008). Because of changing social structures with a rising age in our societies we need maximum stability for the treatment of proximal femur fractures. In this investigation we compared the DHS with the Gamma 3 and the PFN A Nail.

Material and Methods: We used 18 pairs of fresh frozen cadaver femura. A CT scan was made to document the BMD (BMD mean 269,9). Three randomized groups of 6 pairs were formed. After the osteosynthesis with the implants was done the fracture (A2.2) was made with a jigsaw. For further destabilisation the troch. minor was removed. The femura were fixed in the testing machine and tested under dynamic condition with a physiologic load for normal walking (2.5x bodyweight) under 25 000 cycles. We measured the load on the Implant, the migration and rotation of the bone around the Implant. The data was dokumented with Lab view,

Results: The intramedulare implants showed significant lower migration rates (mean 2.7 mm) of the head compared to the extramedular implants (mean 9.6 mm). The rotation of the head around the lag screw startet earlier within the DHS an showed higher rates (mean 32°) followed by the Gamma 3 (mean 23°) until the end of the 25 000 cycle. The best stabilisation against rotation was documented for the PFN A (mean 13°). The post X-rays showed a significant migration and sintering process of the femoral head with lateralisation and fracture of the lateral wall. This was even higher in probes with a low BMD.

Conclusion: The intramedular implantes (Gamma 3/PFN A) give a better stabilisation in A2.2 fractures of the proximal femur in the matter of rotation and migration than an extramedular implant (DHS). From the biomechanical view we recommend to use intramedular implants for fractures of the proximal and metaphyseal femur.

Disclosure: No significant relationships.

S066 Morbidity and Mortality After Treatment of Femoral Neck Fractures with an Uncemented Hemiarthroplasty in Patients with a Biological Age of 80 Years or More

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Introduction: Several studies have been performed to identify significant predictive values in morbidity and mortality after femoral neck surgery with a cemented hemiarthroplasty. We analysed important significant predictors of post-operative morbidity and mortality in two different uncemented hemiarthroplasties.

Material and Methods: A retrospective study of 113 patients (82 female, 31 male) who have been treated with 114 cementless hemiarthroplasties (71 Omnifit and 43 Symax) for femoral neck fractures between January 2002 and December 2005 was conducted. Median age was 81 years (81.81 ± 6.60). Patient's medical records were studied for comorbidities and per- and post-operative complications, mortality, and radiographs were analysed.

Results: General post-operative mortality at one, six and twelve months follow-up was 8.8%, 23.7% and 34.9% respectively. Mostly seen complications were delirium (23.9%), urinary tract infections (23.0%), cardiac complications (7%), pulmonary complications (7%, no pulmonary embolism), dislocations ($n = 3$, 2.6%, all Omnifit and posterolateral approach), per-operative fractures ($n = 3$, 2.6%, all Omnifit), deep wound infections ($n = 2$, 1.8%), strokes (1.8%) and deep venous thrombosis ($n = 1$, 0.9%). 0 Per-operative deaths, 0 lungembolisms and 1 DVT were seen. Significant predictive values: Pulmonary co-morbidity was predictive of death within one month (33.3%vs5.7%; $p < 0.001$; OR8.300; 95%CI 2.405-28.650). No significant predictive values were seen for 6 and 12 months post-operative. Dementia was predictive of delirium (both diagnosed by a geriatric specialist) (40.0%vs19.5%; $p < 0.05$; OR2.745; 95%CI 1.051-7.167). Calendar age above 80yrs was predictive of urinary tract infection (32.3%vs10.4%; $p < 0.01$; OR4.105; 95%CI 1.419-11.871).

Conclusion: The significant predictors of post-operative morbidity and mortality are consistent with those found in studies about cemented hemiarthroplasties of the hip with a higher risk of the negative effects of cementing. The negative effects of cementing like DVT (literature: 1,3-1,8%) and pulmonary embolism (literature: 0,5-3,0%) and per-operative death (literature: 0,08-0,20%) however can successfully be reduced.

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Disclosure: No significant relationships.

S067 Management of "Cut Out" After Intramedullary Nailing in Trochanteric Femoral Fractures

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Introduction: Excising part of an implant through the femoral head is a rare but severe complication of osteosynthesis of proximal femoral fractures.

There is little evidence in the literature about incidence and management of this complication. According to opinion leaders in a recent international user meeting most cases end up in Total Hip Arthroplasty (THA). The value of re-osteosynthesis remains unclear. Most patients that suffer an excision are geriatric and multimorbid patients, rather suitable to less invasive revision surgery. To assess the incidence and management of cutting out of the PFNA blade (Proximal Femoral Nail Antirotation by Synthes GmbH International) was the aim of this multicenter study.

Material and Methods: The incidence and management of excision of the PFNA blade in trochanteric femoral fractures was assessed retrospectively in 3092 cases in 15 participating hospitals all over Europe in a time period between 2003 and 2009. All implantations were screened for this complication. The preoperative, follow up x-rays and patients' medical records including the surgical reports were collected and analysed with a special focus on revision surgery until union or THA.

Results: The incidence of excision of the implant was 1.3% (41/3092). The mean age of patients was 80 years. 76% of mostly female (86%) patients sustained an unstable 31A3 fracture according to the AO classification. Final revision surgery was performed with THA in 19 cases (48%). In 21 cases re-osteosynthesis led to union (52%). Re-osteosynthesis was either exchange of blade with or without cement augmentation alone or re-nailing. In 8% of THA revisions additional revision was necessary. In 45% of revisions with exchange of blade additional revision was required (all THA). 83% (5/6) of revision cases with cement augmented blades healed. In 20% of revision with re-nailing, additional surgery was inevitable. On average 2.5 operative procedures were performed after excision of the PFNA blade.

Conclusion: Cutting out of the blade of the PFNA is a rare complication. Nevertheless the management after removal is challenging as indicated by the high number of surgical revisions. Revision with Total Hip Arthroplasty showed a lower rate of reoperations compared to re-osteosynthesis. Nevertheless 52% of all revision cases were managed successfully with a minimally invasive osteosynthesis. This gives a rationale for osteosynthesis in managing this complication in geriatric multimorbid patients with a high risk for operation.

References: 1. Simmermacher, R. K., J. Ljungqvist, et al. (2008). "The new proximal femoral nail antirotation (PFNA) in daily practice: results of a multicentre clinical study." *Injury* 39(8): 932-9. 2. Haidukewych, G. J. and D. J. Berry (2003). "Salvage of failed internal fixation of intertrochanteric hip fractures." *Clin Orthop Relat Res*(412): 184-8.

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S068 Fixation Failure of the LCP Proximal Femoral Plate 4.5/5.0 in Unstable Per-, Inter-, And Subtrochanteric Fractures of the Proximal Femur

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Introduction: Comminuted unstable per-, inter- or subtrochanteric fractures are challenging injuries. The Proximal Femur LCP 4.5/5.0 (PF LCP) (Synthes, West Chester, Pa) was introduced in 2007 in Europe. In a prospective series of subtrochanteric fractures with or without involvement of the pertrochanteric region and in revision procedures of this area the PF LCP was applied. In 4 out of 14 patients a fixation failure was observed. This paper reports on these fixation failures.

Material and Methods: All patients with a multifragmented subtrochanteric fracture with or without involving the trochanteric or the femoral neck region which were judged to present a compromised nail entry point from May 2007 until May 2008 were stabilized using the PF LCP. The plates were applied in a minimally invasive manner through soft tissue windows (MIPO). Intrinsic stability of the fixation was increased by excentric drilling or applying the tensioning device. All patients were followed up to fracture healing. Intraoperative and postoperative complications were noticed. Intraoperative and postoperative x-rays were analysed using the CCD angle and the Gardens alignment index.

Results: We report 4 out of 14 patients who sustained a fixation failure with secondary varus collapse requiring 3 revision surgeries until healing. Revision consisted in a reosteosynthesis in one, a plate exchange to a 95° blade plate in the second and a DHS in the third patient. In all our reported cases of implant failure the posteromedial buttress was missing [two AO 31 A2 and two Seinsheimer type V], and all patients were not able to restrict weight bearing due to different reasons like, noncompliance (alcohol abuse, limited force, advanced age) leading to increased axial bending forces and finally to breakage of the femoral neck screws with varus collapse of the fracture.

Conclusion: In conclusion the PF LCP proximal femoral plate 4.5/5.0 due to its guide wire technique allows for straightforward plate application and reduction also in very complex fractures of the trochanteric region, including fractures with extension into the greater trochanter or reverse oblique intertrochanteric fractures. However in fracture patterns with missing posteromedial support and limited ability to restricted weight bearing (e.g.: advanced age, additional handicap or mal-compliance) an alternative fixation device should be considered, e.g. the hook plate extension of the LCP proximal femoral plate to apply higher intrinsic stability of the fixation when using the tensioning device. Further clinical and biomechanical studies are needed to evaluate the potentiality and limitation of this device for the treatment of these challenging fractures of the trochanteric region.

Disclosure: No significant relationships.

S069 Operative Treat of Trochanteric Area Fractures with DHS

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Introduction: Management of proximal metaphyseal fractures of femoral bone appears quite challenging, mainly due to osteoporosis problems mostly affecting aged group, and in polytrauma cases, involving young patients, which is related to multiple problems regarding fracture stabilization and consolidation.

Material and Methods: Osteosynthesis with DHS was performed on 135 patients with proximal metaphyseal fractures of femoral bone,

with age ranging from 16 - 92 yr. (mean age 57.7 yr, males -71, females - 64), in the period of 2002-2009. Type 31-A1 fracture was presented in 45 patients, type 31-A2 - in 38 and type 31-A3 - in 52 patients, respectively. In 7 cases involving adolescent patients from traffic accidents with type A2 fractures, fragment dislocation reached such extent that preliminary complete indirect reduction on extension table could not be achieved and open reposition was required. For achieving more stability and better adjustment of varus-inducing stress, we were trying to guide the dynamic screw through femur neck with slightly caudal direction from central axis, near to Adams arch. Additional fixation with one 6.5 mm spongy screw inserted proximally to dynamic screw was performed in 32 cases, and in 8 cases (with trochanter major fragmented fracture) - with trochanter stabilizing plate.

Results: Complete fracture consolidation in 1.5 - 4 months period (average 3.1 months) was achieved in 133 cases. Patients began walking on crutches with partial lean on the operated limb on 2-5th day after operation, and complete rehabilitation (walking without any extra-support with good recovery of joint rotation) was achieved in 1.5-4.5 months period. In 1 case, cranial dislocation of the screw was observed and non-union fracture ensued, and in 1 another case, deep wound infection developed, due to which DHS was removed.

Conclusion: Utilization of DHS in proximal metaphyseal fractures of femoral bone provides a stable and reliable fixation and contributes to early mobilization and rehabilitation of the patients.

Disclosure: No significant relationships.

S070 Analysis of Failed Pertrochanteric Femur Fractures: Incidence, Causes, Outcome

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Introduction: Pertrochanteric femur fractures are very common injuries in aged and very old people. There are intra-, and extra-medullary implants as established rehabilitation possibilities to choose. If not improved, the failure of the implant, by the onset of osteosynthesis material is the most frequently postoperative complication. Especially fractures placed pertrochanteric are posing a challenge for the surgeon. Besides the special morphology of the fracture the osteoporosis is a main reason for the poor operational outcome. Still we have got many debates how the best treatment looks like. There is still no evidence based consent for the implant choice and none for the positioning of the femoral head component. In this analysis we show the incidence and failure behaviour of our patients treated during the last years.

Material and Methods: From January 2004 to June 2009 423 patients with unstable pertrochanteric femur fractures underwent an internal fixation (Gamma3-nail, PFN, SHS, PFNA) in our clinic. We preferred the intramedullary fixation. (DHS 93 vs. 261 intramed. Fixation) We reviewed the X-ray-documentation and hospitalisation-reports of 416 treated patients. (Mean age = 77, mean hospitalisation time = 14 days, percentage female 75%) We were looking for revision operations, mechanical complications like cut out, periimplant-fractures, and other minor complications.

Results: In the 423 revised patients we detected 14 cut-out-situations, 7 periimplant-fractures and 14 minor complications like prolonged

wound secretion or tractus insufficiency. The percentage of cut outs was mild elevated in the extramedullary fixating group (3% vs. 2%). The mean time to cut out was about 104,3 days in PFN-treatment and about 10 days in DHS-group. The operation time of the revision-operations was about the 2-fourfold of the primary operation time. The majority of the the former fixation was replaced by a blade plate. In 25% we performed a total hip prosthesis. In these cases we saw an overproportional tend to prosthesis-luxations.

Conclusion: We conclude that mechanical complications like cut out are a little more frequent after DHS-implantation and should be treated by change to a blade-plate-osteosynthesis. This allows a fracture consolidation in that the minor trochanter becomes that stable, that a regular total hip replacement becomes possible. This seems to be the best prevention of mechanical complications after posttraumatic hip replacement like luxations.

Disclosure: No significant relationships.

S071 The Impact of Anaemia and Blood Transfusion on the Outcome of Elderly Hip Fracture Patients

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Introduction: Hip fractures often concern elderly patients with a high degree of co-morbidity and therefore susceptible for the associated postoperative morbidity and mortality. According to the literature, several factors have an influence on the amount and severity of postoperative complications after hip fractures. Low preoperative haemoglobin levels (Hb) in elderly patients seem to be associated with increased short-term morbidity and even mortality after surgery. The aim of this study was therefore to establish the impact of anaemia and blood transfusion on postoperative recovery of hip fracture patients.

Material and Methods: For this study all consecutive patients operated for a hip fracture at the surgical department of our hospital between January 2005 and June 2009 were included. Data were retrospectively retrieved and reviewed from the patients records. Exclusion criteria were age < 65 years, polytrauma and pathologic fractures. Anaemia was defined as a hemoglobin level (Hb) below 13.0 grams per deciliter for males and below 12.0 grams per deciliter for females. Primary outcomes were postoperative complications, length of stay in the hospital and in hospital mortality

Results: A total of 465 patients with a hip fracture were included, of which 75,3% were women. The mean age was 83.2 years (range 65 - 99). Mean Hb at admission was 12.4 SD 1.5 g/dL, direct postoperative 9,9 SD 1.6 g/dL and at discharge 10,6 SD 1.3 g/dL. Anaemia was present in 58.3% of all patients on admission, 95.4% direct postoperative and 89.1% at discharge. Mean Hb drop following surgery (from admission to postoperative level) was 2.6 SD 1.6 g/dL, and this was correlated to an increased length of stay ($p < 0.008$). Overall, 200

patients (43.1%) received an average of 6.2 units of Red Blood Cells (RBC's). Of all transfusions, 70% was given the first day after surgery. Lower Hb at admission was associated with more postoperative complications ($p < 0.019$) and an increased length of stay ($p < 0.003$), but was not associated with a decrease in hospital death ($p < 0.69$). The number of RBC units was correlated to a decreased length of stay ($p < 0.0003$) and an increased number of postoperative deliriums ($p < 0.036$). Transfusion was not associated with lower odds of re-admission and death.

Conclusion: According to the results of this study almost all patients with a hip fracture experienced a drop in Hb following surgery. Lowered Hb at admission was associated with more postoperative complications and an increased length of stay. Treatment of anaemia with RBC transfusion had a positive influence on the length of stay. Early diagnosis and treatment of anaemia in elderly patients with a hip fracture seems to be an important factor in postoperative recovery, though more research is necessary for a definitive answer.

References: ¹Gruson KI et al. The relationship between admission haemoglobin level and outcome after hip fracture. *Orth Trauma* 2001;16:39-44

Disclosure: No significant relationships.

ANKLE-FOOT

S072 Functional Treatment or Cast Immobilization After Minimal Invasive Repair of an Acute Achilles Tendon Rupture. Results of a Prospective, Randomized Trial

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Introduction: Operative repair of acute Achilles tendon rupture (ATR) reduces the risk of rerupture compared with conservative treatment and has therefore gained popularity as a standard treatment for ATR.¹ There is ongoing controversy over the surgical technique and post-operative treatment. In this prospective, randomized trial we treated patients with ATR with a minimal invasive surgical technique and compared cast immobilization and functional treatment with early mobilization and weight bearing for aftercare.

Material and Methods: All patients with ATR presenting in the VieCuri hospital were included. Exclusion criteria were systemic immunosuppressive therapy, reruptures and severe co-morbidity. All included patients underwent minimal invasive surgery. After surgery a below-knee plaster with the foot in 10° plantar flexion was applied for the first week. After one week patients were randomized in a cast immobilization group (IG) or functional group (FG). Data were collected preoperatively and during the outpatient checks at 1,3 and 6 weeks, 3 and 6 months and 1 year. Outcome parameters were return to work or sport, complications including rerupture, Achilles tendon performance score, loss of strength, range-of-motion, subjective result and quality of life.

Results: For this interim analysis we included 39 patients, 31 men and 8 women. 31 patients have a follow-up period of over 6 months and 24 patients have a follow-up period over one year. Mean age for the entire population is 45 years (range 19-65). There are no differences

in baseline-characteristics for both groups. Statistical analysis at 3, 6 and 12 months post-surgery shows no statistically difference between both groups for return to work or sports, no difference for strength and no difference for quality of life. In the FG at 3 weeks post-surgery patient have statistically more physical complaints or pain than patients in the IG, 70% vs 20%. This difference levels after a longer follow-up period. We saw three complications, one patient in the IG had a rerupture and one patient in the IG had deep vein thrombosis, despite LMWH. One patient in the FG had severe pain and left the study protocol.

Conclusion: Minimal invasive repair of ATR is a safe and reliable technique. This analysis shows no major differences between both post-operative strategies. Early mobilization seems to be as safe as more traditional immobilization post-operative. Although not statistically different we see more major complications in the IG. This study protocol is still running with possibly more major results after inclusion of more patients.

References: 1. Khan RJK, Fick D, Brammar TJ et al. Surgical interventions for treating acute Achilles tendon ruptures. Cochrane database of systematic reviews 2004, Issue 3. Art.No.:CD003674. DOI:10.1002/14651858.CD003674.pub2. **Disclosure:** No significant relationships.

S073 A Retrospective Study of the Use of Autologous Platelet-leucocyte Rich Plasma (P-LRP) in Achilles Tendinopathy

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Introduction: There is a high prevalence of Achilles tendinopathy in active people and recreational and professional athletes causing significant physical inactivity. At this moment, there is no consensus on the best form of non-surgical treatment, because there is insufficient evidence from randomised controlled trials. The best accepted treatment is a rehabilitation program, based on eccentric training. However, autologous P-LRP combines platelet concentrate with thrombin and provides a controlled release of platelet derived growth factors in order to stimulate and increase cellular activity and healing.

Material and Methods: In this retrospective study patients with Achilles tendinopathy were treated with autologous platelet-leucocyte rich plasma. This P-LRP was prepared, by special centrifugal techniques, from freshly drawn autologous whole blood. The exact location of the Achilles tendinopathy was identified by ultrasound and subsequently the P-LRP was injected. Primary outcome was return to sport and daily activity, based upon the VISA-A score. Secondary, pain was scored with VAS-scales.

Results: In the last 2 years over 75 patients with Achilles tendinopathy were treated with ultrasound guided injection of P-LRP. At the

11th ESTES congress in Brussel, we would like to present the results after 3, 6 and 9 months follow-up.

Conclusion: At this moment the follow-up is not yet completed, so therefore it is not possible to draw any conclusions.

References: v Linschoten R, den Hoed PT, de Jongh AC. Richtlijn 'Chronische achillestendinopathie, in het bijzonder de tendinosis, bij sporters'. Ned Tijdschr Geneesk 2007;151(42):2319-24. Kingma JJ, de Knikker R, Wittink HM, Takken T. Eccentric overload training in patients with chronic Achilles tendinopathy: a systemic review. Br J Sports Med 2007;41:e3. McLauchan GJ, Handoll HH. Interventions for treating acute and chronic Achilles tendinitis. Cochrane Database Syst Rev 2001;2:CD000232. Rompe JD, Furia J, Maffulli N. Eccentric loading compared with shock wave treatment for chronic insertional achilles tendinopathy. A randomized, controlled trial. J Bone Joint Surg Am 2008;90:52-61. de Mos M, van der Windt AE, Jahr H, van Schie HTM, Weinans H, Verhaar JAN, van Osch GJVM. Can platelet-rich plasma enhance tendon repair? A cell culture study. Am J Sports Med, 2008 March 7 [Epub ahead of print].

Disclosure: No significant relationships.

S074 Are the Ottawa Rules Helpful to Predict Ankle and Foot Fractures in Sports Activities?

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Introduction: This instrument (Ottawa rules) consists of a questionnaire for assessment of the ankle and foot and need for radiography. Our purpose was to validate the Ottawa ankle rules to predict ankle and foot fractures in sports activities as clinical setting, when they are used in emergency department

Material and Methods: We used a prospective patient survey by emergency physicians in Orthopaedic emergency department of a university hospital. The study group consisted of 226 consecutive patients aged 18 years and older who presented with acute ankle or midfoot injuries during a 8-month period. Radiography was performed in each patient after clinical evaluation findings were recorded.

Results: Twenty-nine ankle and 12 midfoot fractures were diagnosed. The decision rules had a sensitivity of .89, a specificity of .34, and a negative predictive value of .89 in detecting ankle fractures, a sensitivity of .85, a specificity of .29, and a negative predictive value of .9 in detecting midfoot fractures. The rules failed to predict 4 avulsion fractures in the ankle group. Application of these rules by emergency physicians would have reduced ankle or midfoot radiography requests by 22%.

Conclusion: Use of the Ottawa ankle rules by emergency physicians resulted in 85% sensitivity and had a potential of reducing radiography requests by 23%. Since the Ottawa ankle rules is an instrument that is calibrated towards high sensitivity of 100%, in our patients were less sensitive than clinical suspicion alone. In our opinion low sensitivity for all fractures (ankle and midfoot) would not allowed physicians to safely reduce the number of radiographs with Ottawa rules.

References: 1. Perry JJ, Stiell IG. Impact of clinical decision rules on clinical care of traumatic injuries to the foot and ankle, knee, cervical spine, and head. *Injury*. 2006 Dec;37(12):1157-65. 2. Yazdani S, Jahandideh H, Ghofrani H. Validation of the Ottawa Ankle Rules in Iran: a prospective survey. *BMC Emerg Med*. 2006 Feb 16;6:3. 3. Fan J, Woolfrey K. The effect of triage-applied Ottawa Ankle Rules on the length of stay in a Canadian urgent care department: a randomized controlled trial. *Acad Emerg Med*. 2006 Feb;13(2):153-7.

Disclosure: No significant relationships.

S075 Functional Results After Surgical Treatment of Ankle Fractures in Athletes: Review of 60 Cases

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Introduction: In athletes, around 10 to 20% of the lesions occur at the level of the ankle. Professional and amateur athletes, with unstable ankle fractures, treated surgically and submitted to an adequate programme of physical rehabilitation had better functional results. The objective of this study is to evaluate retrospectively the functional results and return to sports activity in athletes after surgical treated ankle fractures(1).

Material and Methods: This study included 60 patients who between January 2000 and December 2007 had unstable ankle fracture while practicing sports activity and were submitted to open reduction and internal fixation(2). The patients were evaluated according to demographic, imagiological, clinical and functional variables. The patients were also assessed using the Short Musculoskeletal Function Assessment (SFMA) score and the American Orthopaedic Foot and Ankle Society (AOFAS) score(3).

Results: There were 16 women and 44 men with medium age of 24,2 years (18-45 years) and with medium follow-up of 2 years (1-6 years). The lesions occur in 8 sports, 50% of the fractures occur while practicing soccer. The fractures were bimalleolar (n = 30), medial malleolus (n = 11), lateral malleolus (n = 10), with syndesmotic lesion (n = 6) and trimalleolar (n = 3). 6 months after surgery 22% of the patients returned to sports activity and at 12 months 43%. At 12 months the younger patients (p = 0,0001) and men (p = 0,001) returned earlier to sports activity. At one year 80% of the amateur and 20% of the professional athletes, had returned to sports practice. Fractures of the lateral malleolus returned earlier in 16,2 weeks than medial malleolus fracture in 59,5 weeks. The SMFA and AOFAS scores were high in all types of fracture.

Conclusion: Correct treatment of instable ankle fractures in athletes, with anatomic reduction and preservation of the integrity of the articular surface, is crucial to the return to sports practice. The fractures that influence an earlier return were younger age, male sex and less severe fracture, and negative predictors were older age and female sex. Athletes submitted to open reduction and internal fixation with adequate and precocious programme of physical rehabilitation, can return to the same level of sports practice, despite the seriousness of the fracture without pain and functional limitation(4).

References: 1. SooHoo N. Complication rates following open reduction and internal fixation of ankle fractures. *J Bone Joint Surg*

Am. 2009;91:1042-49. 2. Day G., Swanson C. Operative treatment of ankle fractures: a minimum ten-years follow up. *Foot Ankle Int*. 2001;22:102-6. 3. Kitaoka H., Alexander U. Clinical rating systems for the ankle-hindfoot, midfoot, hallux and lesser toes. *Foot Ankle Int* 1994;15:349-53. 4. Calvin A., Walsh M. Return to sports following operatively treated ankle fractures. *Foot Ankle Int*. 2009 Apr;30(4):292-6.

Disclosure: No significant relationships.

S076 Ligament Reconstruction in Surgical Treatment of Ankle Fractures

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Introduction: The medial ligaments of the ankle are often injured that leads to ankle instability.

Material and Methods: 68 of 71 patients with operated ankle fractures reported a deltoid ligament injury. The fibula was synthesized with 1/3 tube, reconstructive, metaphyseal and also blocked plates. Four methods were used to restore the deltoid ligament: 1. percutaneous suture technique (10), 2. Open suture method (8), 3. anchor screw fixation (30), 4. conservative technique (plaster bandage, brace) (20).

Results: In the latter group one of the patients developed repeat ankle instability. Ultrasound detected ligament nonunion. 13 patients reported tough connective tissue at the place of ligament rupture. There were multiple ossificates in paraarticular structures in 5 cases. In group 1 (30 cases with anchor screw fixation) the connective tissue was less rough compared to the screening group, one patient had ossificates in paraarticular structures.

Conclusion: Surgical restoration of the deltoid ligament along with the spellbone osteosynthesis obviously helps to receive better treatment results. The implementation of a screw anchor provides better recovery of the deltoid ligament retaining its flexibility regardless of injury prescription or rupture localization.

Disclosure: No significant relationships.

S077 Postero-lateral Plate Fixation of the Volkmann Triangle in Trimalleolar Luxation Fractures

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Introduction: The need for the fixation of the so-called Volkmann triangle which are bigger than 25% of the articular surface, is well established. Current techniques are either indirect reduction from anterior or direct fixation by a postero-lateral approach. However the latter has yet been poorly investigated.

Material and Methods: Between 2000 and 2008, 29 patients (10 male, 19 female; mean age 54.03 (range: 29 – 88)) with trimalleolar fractures (AO 44 B3-C3) were treated with open reduction and direct postero-lateral plate fixation of the Volkmann triangle. ORIF of the fibula and the medial malleolus was performed in a usual manner. Surgery was performed in lateral decubitus, the access to the distal tibia was gained by a way posterior to the peroneal tendons.

Results: In all cases anatomic reduction could be achieved. No secondary dislocation was observed and all fractures healed uneventfully.

Conclusion: Indirect reduction of the Volkmann triangle from anterior makes an image intensifier mandatory and has potential of not achieving anatomic reduction due intercalated tissue. In larger fragments the fixation with a lag crew from anterior, the buttressing effect might not be sufficient to avoid secondary displacement. With the use of a postero-lateral approach and dorsal plate for fixation of the Volkmann triangle, it is possible to reliably obtain an anatomical reduction of the dorsal articular surface of the tibia, thus potentially minimizing the risk of posttraumatic osteoarthritis.

Disclosure: No significant relationships.

S078 What's the Meaning of Tibiofibular Shifting After Syndesmotic Screws? A Prospective Study

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Introduction: Postoperative CT control after ankle fractures is recommended in several studies, especially after implantation of a syndesmotic screw. In consequence, we see more pathologic results like anterior shifting of the fibula in the incisura tibiae. A previous study disclosed worse clinical results in patients with anterior shifting after implantation of a syndesmotic screw. In this prospective study we present a new index (tibiofibular shifting index) that objectifies this shifting. It takes in account the individual anatomy of the incisura tibiae and gives information about the clinical relevance of this shifting.

Material and Methods: 49 patients (f:m = 18:31, 18 – 87 years, median 39) after implantation of a syndesmotic screw in ankle fractures were included. According to the AO classification there were 35 (71.5%) C fractures and 14 (28.5%) B fractures. CT measurement was done with the MagicWeb® Software (Siemens, Germany). The index A was calculated as the ratio of shifting of the fibula of the non-operated and of the operated side in the axial CT planes, one centimetre above the tibial plafond. If both sides are identical, A = 1; if A > 1, the fibula is shifted anterior. Two investigators classified the degree of shifting (no shifting, moderate or clear shifting) and the index was calculated. Clinical results were assessed by the scores of Philipps, Olerud/Molander and Weber after removal of the screw.

Results: The average index was 1.75 (0.31-6.3; Median 1.20). In those fibulae classified as clearly shifted (n = 7), the average index was 4.48 (3.07-6.3; Median 4.64). In patients with minor shifting (n = 8), the average index was 2.17 (1.22-2.75; Median 2.29). In patients without shifting (n = 35), the average index was 1.10 (0.31-2.04; Median 1.07). So there is no shifting if A < 1; if 1 > A < 3 there is moderate shifting and if A > 3 anterior shifting is assured. In the clinical follow-up patients had in average good to very good results, while patients with an index A > 3 had significantly worse results.

Conclusion: This study confirms that tibiofibular shifting indeed has an influence on the clinical results after syndesmotic screws. The tibiofibular shifting index is a good method to find pathologic CT

results. The measurement can easily be done with the standard software as it is common in most hospitals nowadays. The index objectifies the CT results, improves its informative value and it is helpful to predict the clinical result. Proceed to step 9

References: Direct Visualization for Syndesmotic Stabilization of Ankle Fractures Anna N. Miller et al., 2009, Foot and Ankle International Postoperative Computed Tomography-based Control of Syndesmotic Screws Schwarz und Köfer, 2005, Eur J Trauma

Disclosure: No significant relationships.

S079 Effectiveness of the Continuous Lymphological Multi-Layer Compression Therapy and of the AV-impulse Compression in the Treatment of Pre- and Postoperative Edema in Patients with Ankle- and Hindfoot Fractures

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Introduction: After ankle- and hindfoot fractures, edema often delays surgery and postoperative mobilisation. Therefore effective treatment of edema is of great importance. The aim of this study was to evaluate the efficacy of the continuous lymphological multi-layer compression therapy and of the AV-intermittent impulse compression (AVI) in reducing ankle- and hindfoot edema.

Material and Methods: Randomized, controlled, single-blinded, clinical trial. 64 patients (40 ± 15 years, 41 m, 23f) with unilateral fractures of the ankle or hindfoot pre- or postoperatively were randomized into A) the control group (elevation and cold packs), B) the continuous multi-layer compression therapy group (CCT) or C) the AV-impulse compression group (AVI). Primary outcome was the pre- respectively postoperative reduction of edema as measured with the figure-of-eight method₂₀.

Results: Pre- and postoperatively the continuous lymphological multi-layer compression therapy (CCT) showed a significant better edema reduction when compared to the control group. After three days of intervention the mean preoperative edema reduction in the control group was -3.8 ± 10.4 mm (11.1%) figure-of-eight method₂₀ vs. -13.5 ± 6.7 mm (39.5%) in the CCT group (p < 0.01) and vs. -5.7 ± 9.3 mm (17.6%) in the AVI group. Three days postoperatively the mean edema reduction was -3.9 ± 9.8 mm (12.6%) in the control group vs. -11.6 ± 6.5 mm (34.5%) in the CCT group (p < 0.05) and -5.1 mm ± 15.6 (19.4%) in the AVI group. Pre- and postoperatively the CCT group shows moderate effect sizes after two days of intervention and large effect sizes after three days. AVI is more effective when combined with elevation during off-session periods.

Conclusion: Continuous lymphological multi-layer compression therapy leads to a clinical relevant and significant better reduction of ankle- and hindfoot edema as compared to the standard treatment with elevation and cold packs. AV-intermittent impulse compression shows a tendency towards a better edema reduction compared to the standard treatment. Continuous lymphological multi-layer compression therapy reasonably can be applied when edema delays operation

or postoperative mobilisation. Considering the AVI application we strongly recommend to elevate the leg during off-session periods.

References: Bleakley et al. Am J. Sports Med. 2004;32:251-261. Caschman et al. J Orthop Trauma 2004 Oct;18(9):596-601. Rohner-Spengler et al. J Orthop Sports Phys Ther 2007;37(4):199-205.

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HEALTH ECONOMICS

S080 The Financial Impact of Private Helicopter Emergency Medical Services

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Introduction: The purpose of this study is to study the financial impact that air transport (AT) via private, independent helicopter services, compared to ground transport (GT), can have on a Level I Trauma Center in an urban public hospital setting.

Material and Methods: We reviewed hospital finance records for all patients transported to the Trauma Center via AT between May 2005 and June 2008, and a set of records for a randomized group of GT patients who were transported during that same time period for comparison purposes. Patients were excluded if they were declared dead within six hours of arrival at the institution. We analyzed patient billing and collections data for all subjects at day 30, 90, 180, and 360. This research was determined to be exempt from review by the Institutional Review Board.

Results: There were a total of 488 patients reviewed as a part of this data set; 242 patients were transported via GT (49.6%) and 246 were transported via AT (50.4%). GT had a higher percentage of indigent patients (49%) than AT (17%). The charges billed for AT was \$33.1 M and GT was \$6.51 M. The net gain for AT was \$18.2 K per patient; net loss for GT was \$2.34 K per patient.

Conclusion: The gains from AT patient collections, compared to the losses from GT patients, is sufficient to indicate that the revenue stream and gains a hospital can draw from using private AT services will exceed the costs associated with affiliated with a private AT company. Use of private, non-hospital-funded AT financially benefits the public Trauma Center.

References: 1. Melton JTK, Jain S, Kendrick B, Deo SD. Helicopter Emergency Ambulance Service (HEAS) transfer: An analysis of trauma patient case-mix, injury severity and outcome. Ann R Coll Surg Engl 2007; 89(5): 513-516. 2. Carr BG, Caplan JM, Pryor JP, Branas CC. A meta-analysis of prehospital care times for trauma. Prehosp Emerg Care 2006; 10(2): 198-206. 3. Selzer D, Gomez G, Jacobson L, Wischmeyer T, Sood R, Broadie T. Public hospital-based Level I Trauma Centers: Financial survival in the new millennium. J Trauma 2001; 51(2): 301-307. 4. Saywell Jr. RM, Woods JR,

Rodman Jr. GH, Nyhuis AW, Bender LB, et al. Financial analysis of an inner-city helicopter service: Charges versus collections. Ann Emerg Med 1989; 18(1): 21-25. 5. Woods JR, Saywell Jr. RM, Rodman Jr. GH, Nyhuis AW, Pientka ND, et al. Financial analysis of an inner-city helicopter service: Charges versus collections for patients transferred from another acute care facility. Ann Emerg Med 1989; 18(11): 1240-1243.

Disclosure: No significant relationships.

S081 Polytrauma Costs in Spain: Study of the Hospitalisation Costs of a Group of Patients With Severe Trauma

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Introduction: The objective of the study is to define the global hospital costs of a group of patients that suffered from severe trauma. Additionally we identify the distribution of the expenses between the different services and the different procedures fulfilled to the patient.

Material and Methods: We use for the study the database TRAUMASUR where we update in a prospective way all the patients who suffer a severe trauma, from 2003 to 2008 we updated over than 1300 patients. We studied for this work the patients collected in the year 2007, a total of 203 patients. We use the data collected by the accounting department, obtaining the global expense details, also the division of expense between different departments and implicated services in the treatment of the patient.

Results: The mean result in NISS and ISS was respectively 29,7 and 23,2. The mean survival probability was 0,85. The patient's overall cost was 4.399.708 €. The average cost for a patient was 19208 €. The all-in cost for the ICU stay was 2.235.385 €, the in plant hospitalization stay cost was 445.428 €. The average expense percentage on the total of a patient for the ICU stay and in plant stay was respectively 29,9% and 20%, whereas for the prosthetic material was as low as 8,8%.

Conclusion: Patients with a severe trauma suppose an important public health expense. Whithin the global expense caused by these patients the great percentage is owed to hospital stay, specially the ICU stay, whereas the expense of the prosthetic material supposes a small fraction of the global.

References: Lanzarotti S, Cook CS, Porter JM, Judkins DG, Williams MD. The cost of the trauma. Am Surg. 2003 Sep;69(9):766-70. Park CA, Mc Gwin G Jr, Smith DR, May AK, Melton SM, Taylor AJ, Rue LW. Trauma-specific intensive care units can be cost effective and contribute to reduced hospital length of stay. Am Surg.

2001 Jul;67(7):665-70. Sikand M, Willams K, White C, Moran CG. The financial cost of treating polytrauma: implications for tertiary referral centres in the United Kingdom. *Injury*. 2005 Jun;36(6):733-7. Ganzoni D, Zellwegger R, Trentz O. Cost analysis of acute therapy of polytrauma patients. *Swiss Surg*. 2003; 9(6): 268-74. Schmelz A, Ziegler D, Beck A, Kinz L, Gebhard F. Costs for acute, stationary treatment of polytrauma patients. *Unfallchirurg*. 2002 Nov;105(11): 1043-8. Pape HC, Neubauer E, Ridley S, Chiara O, Nielsen TG, Christesen MC. Cost-Drivers in acute treatment of severe trauma in Europe: A systematic review of literature. *Eur J Trauma Surg*. 2009; 35: 61-6.

Disclosure: No significant relationships.

S082 External Factors and the Influence of Survival of Trauma Patients in Germany

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Introduction: The quality of medical care for severely injured patients depends on many different factors. Here we investigated the influence of external factors like time of day, day of week, working hours of medical staff, season, moon phases and weather condition on hospital survival of trauma patients in Germany.

Material and Methods: For this retrospective study we used data from the Trauma Registry of DGU. Patients admitted primarily to a German hospital in the years between 1995 and 2004 were included. The data set was restricted to 10.737 cases with an ISS of 9 and higher and all necessary data available to estimate the RISC score (Lefering 2009). We created subgroups for time of day (4 subgroups), day of week (2), season (4), moon phases (4), times on duty (2) and weather condition (2). The observed mortality was adjusted with the RISC based prognosis and the SMR calculated.

Results: The selected collective had an average age of 40.4 years and 73% of the patients were males. The mean ISS was 26.1 and the mean hospital mortality was of 17.6%. For the time of day the highest rate of admission was between 6:00 and 7:00 p.m., with the highest numbers on Saturdays. In the times of on-call duty (weekend, public holiday, weekday between 5:00 p.m. and 8:00 a.m.) twice as much trauma patients were delivered to trauma centers as within the regularly working hours. In summer, the admission rate was highest (29.2%) and lowest in winter (21.3%), with more victims of car accidents in autumn and winter as in the warm season and more victims of motor- and bicycle accidents in spring and summer as in the cold season. But none of the mentioned factors showed an effect on survival (SMR between 0.98 and 1.00). The moon phases had no influence either on frequency of accidents nor on outcome. The effects of temperature was similar to this of the seasons: with warm temperatures/month less car accidents and more bike accidents occurred (and the opposite for cold temperatures). In the subgroup with temperatures under zero degree the mortality was 4% higher (21.5%) than in the subgroups with temperatures above zero (17.0 to 17.6, even though a similar ISS (26.4 vs. 25.9 to 26.2). In a second step a multivariate analysis was done in order to improve the predictive power, but none of the external factors could improve the prognosis.

Conclusion: There are large variations in the incidence of severe accidents due to time of day, day of week and time of year. But there is no effect of patient's outcome in regard to medical care in German trauma centers. The quality of medical trauma care is consistent around the day, the week and throughout the year.

References: Lefering R. Development and validation of the Revised Injury Severity Classification (RISC) score for severely injured patients. *Eur J Trauma Emerg Surg* 2009; 35:437-47

Disclosure: No significant relationships.

S083 Structural, Organisational and Personnel Changes in Hospitals Participating in the Trauma Network of the DGU

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Introduction: Three years after the initiation of the TraumaNetwork^D of the German Society for Trauma (TraumaNetzwerk^D DGU) the first regional network is now completely structured and working. A total of 781 hospitals are organized in 48 regional trauma networks with 239 more hospitals registered but not yet actively participating. To evaluate changes in structural, organisational, and personnel requirements during the audit process, a questionnaire was sent to all audited hospitals. Furthermore, all participating and audited hospitals were asked for their reasons for participating in the TraumaNetwork^D DGU.

Material and Methods: A questionnaire with 41 questions about structural, organisational, and personnel changes was sent to all audited hospital. 78 Hospitals returned the questionnaire and were categorized into three groups: 20 Supraregional Trauma Centers (highest level), 30 Regional Trauma Centers, and 28 Local Trauma Centers (lowest level). The percentage of changes within each group was compared to distinguish which type of trauma center made the most structural, organisational, and personnel changes. Moreover, we compared the grades (German School System; 1 to 6; 1 = very important, 6 = not important) given to the various reasons for participation within the three groups.

Results: The main changes in all hospitals were organisational (57%), 67% implemented new interdisciplinary pathways, 58% newly participated in the TraumaRegister^{OM}. Structural (17%) and personnel changes (28%) were less often. One noteworthy exception for personnel changes is the increasing number of ATLS®-Providers (76%). Structural changes mostly consisted of the purchase of new instruments for emergency surgery (37%) and of a dedicated ultrasound scanner (27%). Despite the cost 8% of the participating hospitals even installed a new CT scanner in their shock room. The main reasons for participating were improving the treatment of severely injured patients (grade 1.5), clearly defined transferring criteria

(grade 1.8), and the immediate addressability of a larger trauma centre (grade 1.6).

Conclusion: First of all, the number of participating hospitals nationwide documents the great acceptance of the TraumaNetwork^D DGU. Our results show that the majority of hospitals throughout all levels of care in Germany are willing to make changes to improve the treatment of severely injured patients. Whether these changes will eventually result in an even better quality in the treatment of severely injured patients is yet to be seen.

Disclosure: No significant relationships.

S084 Influence on Patient Data and Outcome in a Level-1 Trauma Center After Inauguration of the Regional Trauma Network Saar-(Lor)-Lux-West-Rhineland-Palatinate

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Introduction: Primary object of the nationwide establishment of local regional trauma networks by the German Society for Trauma is the improvement of process and outcome quality in the treatment of severely injured patients. A useful measure for this is the difference between the real and the estimated patient mortality. The latter can be calculated by initial vital parameters and reflects the so-called "Revised injury Severity Classification" (RISC). After inauguration of the trauma network "Saar-(Lor)-Lux-West-Rhineland-Palatinate" in June 2007, we now studied the effects on patient data and outcome compared to the years before. Within this regional cross border network of 21 hospitals, our University Hospital reflects a Level-1 trauma center.

Material and Methods: We conducted a retrospective analysis of our severely injured patients from 2006-2008. Besides the patient quantity, we were interested in the early secondary transferring (< 24 h) and the late secondary transferring (> 24 h) including the reasons for transfer.

Results: During the observation period, there was a steady increase of severely injured patients from 73 to 108 patients. Furthermore, there was a remarkable duplication of primary treatments (95 vs. 46 patients) and accordingly a bisection of the early secondary transferring (13 vs. 27 patients), whereas the number of late secondary transferring was almost constant (133 vs. 130 patients). Additionally, we observed an increasing difference between mortality rate and RISC prediction rate from -0.1% to -5.2%, means less deceased polytraumatized patients than predicted. Within the late secondary transferring patients with spinal cord injuries were leading (35%), followed by patients with pelvic injuries (26%), infections (16%) and complex extremity injuries (16%).

Conclusion: With this investigation, we tried to characterize the influence of the new mapping of Germany on patient data using the example of the regional trauma network "Saar-(Lor)-Lux-West-Rhineland-Palatinate". Although, knowing a lot of interferences, we noticed an abrupt rise of primary admittances of trauma patients in our Level-1 hospital since starting networking. Among the load rejection for smaller hospitals this fact leads to a distinct concentration of the treatment of polytraumatized patients in specialized trauma centers. The improved routine by increased quantity could be

responsible for the improvement of process and outcome quality in the treatment of severely injured patients. But, the enormous quantity of emergency patients also reflects a future challenge in dealing with emergency operations besides routine operations as well as seldom ICU-beds in these trauma hospitals.

References: Kuehne CA et al. (2009) Das TraumaNetzwerk^D DGU 2009, Unfallchirurg 112: 878-884

Disclosure: No significant relationships.

S085 Impact of Tachycardia on Emergency Department Presentation for Non-hemorrhagic Shock Multiple Trauma Patients with Traumatic Brain Injury

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Introduction: The goal of this study was to assess the impact of tachycardia on emergency department (ED) presentation on the outcome of multiple trauma patients with moderate to severe traumatic brain injury (TBI).

Material and Methods: Using retrospective analysis at our tertiary Level I trauma center between 2007 and 2009, we identified blunt multiple trauma patients who had moderate to severe TBI, which was defined as an abbreviated injury score (AIS) ≥ 3 . Patients who were ≤ 15 and ≥ 85 years of age, in cardiac arrest on arrival, those having spinal cord injury, heart rate (HR) ≤ 40 bpm/min, or hemorrhagic shock defined as a systolic blood pressure (SBP) < 90 mmHg and shock index ≥ 1 were excluded. Tachycardia was defined as a HR ≥ 100 bpm/min. Outcome was investigated using the Glasgow outcome scale at hospital discharge. Two study groups were compared. Good recovery or moderate disability were categorized into good outcome (GO) group, and death or considerable vegetative state were categorized into worse outcome (WO) group.

Results: 650 patients had head injury and 44 patients had moderate to severe TBI with multiple injuries. Twelve of 44 patients were tachycardiac on ED arrival. Mean injury severity score (ISS), shock index, revised trauma score (RTS) and trauma and injury severity score (TRISS) were 28 ± 9 , 0.60 ± 0.2 , 6.62 ± 1.3 and 0.76 ± 0.28 , respectively. Most associated injury was chest injury. In the WO group, age, the number of patients with tachycardia, Glasgow coma scale (GCS), mean SBP, RTS and acute physiology and chronic health evaluation (APACHE) II scores were more severe than those in the GO group ($p < 0.05$). After multivariate logistic regression analysis, tachycardia on ED presentation and GCS proved to be independent predictors of worse outcome ($p = 0.048$ and 0.002 , respectively).

Conclusion: In this population of non-hemorrhagic shock multiple trauma patients with moderate to severe TBI, tachycardia on ED presentation was associated with worse outcome. Early assessment of tachycardia on ED presentation are warranted.

Disclosure: This study was supported by a research grant from The General Insurance Association of Japan.

S086 The Timing of Definitive Fixation for Major Fractures in Polytrauma: A Matched Pair Comparison Between US Versus German Patients

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Introduction: Early definitive stabilization is usually the treatment of choice in polytrauma patients. Modifications may be made when patients are in critical conditions, or when associated injuries dictate the timing of surgery. The current study investigates whether treatment in a certain trauma system affects the timing of fracture treatment.

Material and Methods: Consecutive patients treated a Level I trauma center were documented (Group US) and a matched-pair group was gathered from the German Trauma Registry (Group GTR). Inclusion criteria: New Injury Severity Score (NISS) > 17, > 2 major fractures and > 1 organ/soft tissue injury. The timing and type of surgery for major fractures was recorded, as were major complications.

Results: 114 patients were included, n = 57 Group US (35.1% F, 64.9% M, mean age: 44.1 yrs ± 16.49, mean NISS: 27.4 ± 8.65, mean ICU stay: 10 ± 7.49) and n = 57 Group GTR (36.8% F, 63.1% M, mean age: 41.2 yrs ± 15.35, mean NISS: 29.4 ± 6.88, mean ICU stay: 15.6 ± 18.25). 44 (57.1%) out of 77 patients in Group US received primary definitive fracture fixation compared to 61 (65.5%) out of 93 fractures in Group GTR (n.s.). 7 (9.1%) fractures in Group US and 1 (1.1%) fracture in Group GTR was treated with primary traction (n.s.). 19 fractures (24.8%) in Group US and 21 fractures (22.6%) in Group GTR underwent primary external fixation (n.s.) and 7 fractures (9.1%) in Group US and 10 fractures (10.8%) in Group GTR underwent primary external fixation as definitive treatment (n.s.). The average duration until definitive treatment comparable in all major extremities was 5.5 days ± 4.2 days for all major fractures overall in Group US and 6.6 days ± 8.7 in Group GTR (pelvis: 5 days ± 2.8 Group US, 7.1 days ± 9.6 Group GTR (n.s.), femur: 7.9 days ± 8.3 Group US, 5.5 days ± 7.9 (n.s.), tibia: 6.2 days ± 5.6 Group US, 6.2 days ± 9.1 Group GTR (n.s.), humerus: 5 days ± 3.7 Group US, 6.6 days ± 6.1 Group GTR (n.s.), radius: 6 days ± 4.7 Group US, 6.1 days ± 8.7 Group GTR (n.s.)).

Conclusion: While it has been speculated that the trauma system environment might influence the timing of fracture fixation, our results do not support this assumption. The results suggest that a similar approach regarding patient management and clearance for surgery appears to be used in both countries.

Disclosure: No significant relationships.

S087 Assessing Patient Satisfaction with a Nurse-led Fracture Clinic Service

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Introduction: The nurse led fracture clinic service (NLFC) is the first of its kind in the United Kingdom having been set up after the results of a previous study demonstrated comparable levels of satisfaction amongst patients seen in trial doctor and nurse led fracture clinics. The role of the NLFC is to work in parallel to doctor led clinics, assessing and treating uncomplicated musculoskeletal injuries with a favourable natural history. Since its inception, throughput in this clinic has increased and with greater clinical exposure and training, the spectrum of referred injuries has also broadened. The aim of the present study was to determine patient satisfaction with the NLFC using a validated questionnaire with a specific emphasis on how patients viewed being seen by a nurse rather than a doctor

Material and Methods: 173 consecutive patients were prospectively recruited in the NLFC in January 2008. Patients were referred by their respective Consultants after reviewing the presenting history, examination findings and radiographs. After their consultation with the nurse, each patient was asked to fill in a 37 item questionnaire consisting of 6 different domains related to patient satisfaction based on a validated patient satisfaction questionnaire adapted for use in the fracture clinic setting.

Results: There were 173 respondents, 79 men and 86 women, with a mean age of 35 years (range 2-82 years). 35 questionnaires were completed by parents, 4 by carers and the remainder by the patients themselves. The most common treated injuries were distal radial, metatarsal and metacarpal fractures. 97% of patients felt they received the best care from the staff working in the clinic with greater than eighty percent of patients registering satisfaction with the nurse's assessment of their injury, their bedside manner and the treatment and information given. Only 9% of patients felt that they would rather be seen by a doctor for their injury. The highest rates of dissatisfaction related to the building and seating comfort.

Conclusion: Generally, over 85% of patients were satisfied with their clinic visit with the vast majority of patients not having any objection to seeing a nurse rather than a doctor. Patient satisfaction with treatment remains the ultimate outcome measure by which health-care interventions should be assessed. The results of this study demonstrate the NLFC to be an effective method of managing selected patients in a clinic setting thus reducing the workload of patients which would traditionally be reviewed by the doctor. This has significant implications for improving opportunities for doctors training as well as reducing clinic waiting times.

References:

1. SC Williams, D Hollins, S Barden-Marshall, WM Harper. Improving the quality of patient care: patient satisfaction with a nurse-led fracture clinic service. *Ann R Coll Surg Engl* 2003;85:115-116.
2. S Grogan, M Conner, P Norman, D Willits, I Porter. Validation of a questionnaire measuring patient satisfaction with general practitioner services. *Qual Health Care* 2000;9:210-215.

Disclosure: No significant relationships.

SHOULDER-FOREARM-HAND

S088 Surgical Outcome of Displaced Clavicle Shaft Fractures. A Comparative Study of Infraclavicular and Direct Approach

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Introduction: Clavicle fractures represent 5% of fractures in adults and almost 44% of shoulder injuries and are usually treated non-operatively with good results. However significantly displaced fractures can be associated with high non-union rate and there is a lack of consensus on when surgical treatment is indicated for such fractures. The aim of this study was to identify guidelines for surgical intervention, safer surgical approach and outcome of surgical intervention.

Material and Methods: A retrospective audit of all clavicle fractures managed surgically over past 5 years (March 2004 to 2009) in a district general hospital. Case notes were reviewed to study the surgical indication, surgical approach, patient satisfaction and oxford shoulder score and need for metal work removal.

In all 35 patients (29 male) underwent surgery for significant fracture displacement with shortening, manual workers and keen sportsmen at the time of injury. The infraclavicular approach was used in 21 patients and 14 patients had direct incision approach.

Results: Radiological union was achieved in all patients after an average of 13.26(8-24) weeks. Six patients required plate removal at 6 months following surgery, infraclavicular (2 patients) & direct approach (4 patients). All patients returned to their original occupation at average 2.55 months. The Oxford Shoulder Score at 3 months after surgery was average 15 (range 12-20) and all patients, except one, scored excellent on subjective scoring.

Conclusion: Our study showed excellent surgical outcome for displaced clavicle fractures in young and active patients and is supported by the high union rate, good oxford shoulder score, early return to work and high patient satisfaction scores. The infraclavicular approach is a better than direct approach based on the low complication rate and less need for metal work removal.

Disclosure: No significant relationships.

S089 Anatomic Reconstruction of Unstable Lateral Clavicular Fractures

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Introduction: Background: Fractures of the distal clavicle result in a high rate of delayed union and nonunion (30-45%) compared to midshaft fractures. Many operative treatment methods of unstable distal clavicle fractures have previously been described, but no single method has become generally accepted. This study reports our experience treating unstable distal clavicle fractures with coracoclavicular ligament rupture. The distal clavicular fracture is reduced and stabilized with a locking distal radius T-plate, the ruptured coracoclavicular ligaments are augmented using a PDS cord.

Material and Methods: Between 1996 and 2006, 26 patients with acute unstable distal clavicle fractures were treated at the authors'

institution. 19 patients were stabilized using a 2.4 mm distal radius T-Plate and a PDS-cord. These 19 patients were followed-up after a mean of 64 months (20-115 months). Shoulder function was assessed using the Constant score and DASH score. General health of the patients was evaluated according to the Short Form 36 questionnaire.

Results: 18 of the 19 patients treated with our method achieved union at a mean of 8.8 weeks (6-14 weeks), a mean Constant Murley score of 91.5 (72-100) on the injured side versus 93.5 (80-100) on the contra-lateral side, a mean DASH score of 1.4 (0-9.2) and a SF-36 Health Score of 85 (89-100). One patient showed breakage of the plate and a delayed union at the radiological follow up 4 months after surgery. However, the patient had a full range of motion and function and was free of symptoms. After removing the plate 13 months postoperatively, a tight pseudarthrosis was found, but no further surgery was needed.

Conclusion: This retrospective study of 19 patients, treated with a distal radius plate to hold reduction and a PDS cord for augmentation, shows excellent results with a 95% union rate. It allows early full mobilization of the injured shoulder girdle to accomplish a fast return of shoulder function. Additional coracoclavicular augmentation next to plate fixation of the clavicle partially may solve the problem of uncertain plate fixation if the distal fragment is small and fractured, as often observed.

Disclosure: No significant relationships.

S090 Hook Plate Fixation of Dislocated Lateral Clavicle Fractures: Long Term Follow-up Results

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Introduction: The clavicle hook plate is a fitting solution for the problem of the displaced lateral clavicle fracture in our clinic since its introduction in 2001. The purpose of this study was to review the patient population treated and determine long term results associated with this plate.

Material and Methods: We retrospectively reviewed 28 consecutive patients (M:F -20:8) with a displaced lateral clavicle fracture (Edinburgh Type 3B1) with a mean age of 38 years (range 15-64 years) treated with a clavicle hook plate. The clinical data were retrospectively reviewed as well as the radiologic imaging. All patients were contacted for reassessment on the outpatient clinic.

Results: The union rate was 96% (27/28). One patient developed a painful acromioclavicular arthrosis that required a lateral clavicle resection. The remaining patients were discharged from the outpatient clinic after a mean initial follow up of 7 months (range 3-13 months), with a subjective 100% shoulder function. Long term results with a mean follow up of 65 months (5.4 years) showed a good to excellent objective and subjective shoulder function with a DASH score of 3.5 (0-25) and a Constant score of 97 (68-100). In three cases an asymptomatic acromioclavicular arthrosis was diagnosed and in three cases extra articular ossification of which one had symptoms.

Conclusion: We conclude that the clavicle hook plate is a technically easy to apply osteosynthesis for the treatment of displaced lateral clavicle fractures with good results and a low complication rate. We found no long term complications that can be addressed to the use of this plate.

References: 1- Fractures of the Clavicle; LA Kashif Khan, Timothy J. Bradnock, Caroline Scott and C. Michael Robinson; J Bone Joint Surg Am. 2009; 91:447-460

Disclosure: No significant relationships.

S091 Indication for Acromioclavicular Coplaning: Anatomical Considerations

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Introduction: The influence of additional resection of the inferior aspect of the lateral clavicle during subacromial decompression ("AC-Coplaning") is under continuous discussion in the recent literature. Radiological findings, like inferior clavicular osteophytes do not consistently correlate with the clinical symptoms [1-4]. The aim of this study is to evaluate the anatomical correlation between the lateral end of the clavicle and the attachment area of the supraspinatus tendon.

Material and Methods: Using a mathematical model based upon CT-Scan data performed on healthy individuals, the 3 dimensional correlation between the lateral end of the clavicle and the rotator cuff is analyzed. Each individual is examined in supine position, using 3 different positions of the arm (maximum external rotation, maximum internal rotation and maximum abduction and external rotation ("ABER Position"), respectively). For every position the contact area of the lateral end of the clavicle and the supraspinatus tendon is calculated.

Results: Six healthy individuals (12 shoulders) could be included into the study. The average contact area between the lateral end of the clavicle and the supraspinatus tendon (%) is 51.9% for maximum external rotation, 61.7% for maximum internal rotation, respectively. In the ABER position only 4/12 shoulders showed a contact area > 1% (av. 1.6%).

Conclusion: According to these morphological findings the contact area between the lateral clavicle and the supraspinatus tendon is less than 62%. This contact zone is located in the dorsal aspect of the clavicle. Therefore the additional resection of an osteophyte, especially at the anterior part of the lateral clavicle should not have a significant influence on the outcome after subacromial decompression.

References: 1. Barber F A. Coplaning of the acromioclavicular joint. Arthroscopy-the Journal of Arthroscopic and Related Surgery 2001; (17): 913-917. 2. Chen A L, Rokito A S, Zuckerman J D. The role of the acromioclavicular joint in impingement syndrome. Clinics in Sports Medicine 2003; (22): 343-+. 3. Edwards S G. Acromioclavicular stability: A biomechanical comparison of acromioplasty to acromioplasty with coplaning of the distal clavicle. Arthroscopy-the Journal of Arthroscopic and Related Surgery 2003; (19): 1079-1084. 4. Severud E L, Ruotolo C, Abbott D D, Nottage W M. All-arthroscopic versus mini-open rotator cuff repair: A long-term retrospective outcome comparison. Arthroscopy-the Journal of Arthroscopic and Related Surgery 2003; (19): 234-238.

Arthroscopy-the Journal of Arthroscopic and Related Surgery 2003; (19): 234-238.

Disclosure: No significant relationships.

S092 Bankart Repair and Osseous Reaction in the MRI After Arthroscopic Shoulder Stabilisation with Knotless Bio-anchors

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Introduction: The primary arthroscopic stabilization using Suture Anchors is the current Gold Standard procedure for traumatic anterior shoulder instability. The new anchor generation with absorbable materials and knotless fixation technique provides comparable biomechanical strength. In this prospective study the labral reconstruction and morphology as well as the bony reaction and biodegradation were assessed structurally in the MRI. The influence on the clinical outcome has been measured by a complex score system.

Material and Methods: 30 patients after Bankart repair and 31 volunteers (without shoulder instability; Ø26.7y) were assessed structurally in a standardized MRI (Stir + T₁/512 cor. DE sag., PDW + PDW Spir axial; no CM). The „Bankart repair group“ (Ø24.5y at first dislocation; Ø28.1y at surgery, no. of Øpreop. dislocation 4.66 Å ± 7.74) was examined by MRI preoperatively, 14 and 28 months postoperatively (FU 0 + 1+2) and by a score system (Walch-Duplay, Rowe, Constant-Murley, ASES, DASH) after isolated Bankart repair (2x double armed Bio-Pushlock®, Arthrex). The anterior and inferior Labrum Slope (a/iLS), the Labrum-Glenoid Height Index (a/iLGHI) and the labral degeneration (Randelli graduation) were measured (FU 0 + 1+2). The grade of osseous reaction (0-III°) and anchor biodegradation (0-III°) were recorded separately for both anchors (FU 1 + 2).

Results: The Bankart repair group using the Bio-Pushlock® enabled a labrum reconstruction comparable to the control group. After Bankart surgery the anterior portion (aLS 24.4° ± 2.5/aLGHI 3.0 ± 0.6) and inferior portion (iLS 24.8° ± 1.9/iLGHI 2.3 ± 0.5) were similar to the data of the control group (aLS 24.4° ± 2.5/aLGHI 3.0 ± 0.6; iLS 25.0° ± 2.2/iLGHI 2.3 ± 0.3) (p > 0.5) and significantly improved to the preoperative status (aLS 13.9° ± 3.4/aLGHI 1.3 ± 0.5/iLS 15.8° ± 3.7/iLGHI 2.3 ± 0.3) (p = 0.009). There were no longitudinal changes (FU1-2). The labrum degeneration was increased in the Bankart group (p = 0.03). The preoperative number of dislocations had no influence on the Bankart repair data (p > 0.5). The osseous reaction (OR) and the anchor-biodegradation (ABD) were increased for the implants in the lower glenoid portion (OR 1.9°/ABD 2.2°) compared to the upper glenoid (OR 1.1°/ABD 1.5°) after 28 months. The 14 months data showed a generally increased status for OR and ABD. There were no anchor (sub-)dislocations or cystic configuration. The grade of OR and ABD had neither an influence on the function and instability specific score system (p > 0.5) nor on the persisting instability (9.7%; p > 0.5). The score system 28 months after Bankart repair detected excellent results (WD 87.7 ± 6.4; Rowe 89.9 ± 5.1; CM 92.25 ± 6.2; ASES 94.47 ± 4.9; DASH 26.36 ± 3.4) with minimal loss of external rotation in neutral position 3.85° ± 4.05 and 90° abduction 2.11° ± 3.42.

Conclusion: The arthroscopic Bankart repair using knotless, bio-absorbable suture anchors revealed favourable outcome data with restored range of motions. These data proved the secure labrum reconstruction compared to healthy cohort without any gap formations. The biodegradation of the anchor and the osseous reaction occurred without any pathologic findings.

Disclosure: No significant relationships.

S093 Isolated Fractures of the Greater Tuberosity of the Proximal Humerus: A Retrospective Study

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Introduction: The diagnosis and treatment of isolated greater tuberosity fractures as a rare entity of proximal humeral fractures are despite the tremendous growth of knowledge in management a very challenging topic for every orthopaedic surgeon. The aims of our retrospective study were to assess the clinical outcome following conservative and operative treatment of isolated greater tuberosity fractures and to discuss the management strategy.

Material and Methods: Thirty patients (11 men and 19 women; mean age 57.7 years; range 26 – 85 years) with closed isolated greater tuberosity fractures were re-evaluated after a mean of 40.2 months (range 8-120 months) after treatment. Eighteen patients were treated conservatively, twelve patients operatively. The clinical outcome was evaluated using a general health questionnaire, the Disabilities of the Arm, Shoulder and Hand (DASH) score, and the Constant score (CS). Radiographic outcome was assessed on standard plain radiographs of the shoulder.

Results: Fourteen of the seventeen patients with minor displaced (≤ 5 mm) greater tuberosity fractures were treated conservatively, three patients operatively. Patients treated conservatively achieved good to excellent clinical results (mean DASH 13, mean CS 72). One of the three patients operated had an excellent result (DASH 0, CS 92), two patients revealed a poor CS despite of good DASH scores. Patients ($n = 8$) with moderate displacements (6-10 mm) were either treated conservatively ($n = 4$, mean DASH 10, mean CS 72) or operatively ($n = 4$, mean DASH 11, mean CS 73) and showed consistently comparable good functional results. Five patients suffering major displacements (> 10 mm) were all treated operatively with four patients having excellent results in the DASH score (mean 14) and good to moderate outcome in the CS (mean 69), one patient had a moderate DASH score of 57 with a poor CS of 41. Irrespective of treatment strategy the majority of the patients regained normal range of motion and grip strength in the affected shoulder. The most common complication was impingement of the shoulder, which occurred three times in the conservatively and four times in operatively treated patients. All but one conservatively treated patient with a non-union healed without complications.

Conclusion: Minor (≤ 5 mm) and moderate (6-10 mm) displaced greater tuberosity fractures can successfully be treated conservatively with good to excellent long-term rehabilitation of function with a low

risk of complications. Whereas there is no doubt that major displaced fractures (> 10 mm) should be treated operatively, special attention must be paid to moderate (6-10 mm) displaced fractures, as the degree of displacement may be misinterpreted on plain standard radiographs.

Disclosure: No significant relationships.

S094 Long-Term Outcomes of Fractures of Both Bones of the Forearm

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Introduction: A recent study found that after median term follow-up disability correlated with pain rather than the limited residual impairments in motion and strength. We studied impairment and disability an average of twenty-one years after injury in a cohort of Dutch patient, with the hypotheses that 1) objective measurements of impairment correlate with disability, 2) depression and misinterpretation of nociception correlate with disability; and 3) patients injured when skeletally mature and immature have comparable impairment and disability.

Material and Methods: Seventy-one patients were evaluated an average of 21 years after injury. The majority of the 35 skeletally immature patients were treated conservatively with closed reduction and cast immobilization and the majority of the 36 skeletally mature patients were treated with plate and screw fixation. Objective evaluation included radiographs and measurements of range of motion and grip strength. Questionnaires were used to measure arm-specific disability (Disabilities of the Arm, Shoulder and Hand: DASH), misinterpretation or over interpretation of pain (Pain Catastrophizing Scale-PCS-), and depression (CES-D). Multivariable analysis of variance and multiple linear regression were used to analyse the ability of the independent variables to account for variation in the DASH-score. (SPSS 17.0, SPSS inc., Chicago).

Results: There were 44 men and 27 women with an average age of forty-one at time of follow-up (range, 20 to 81). Fractures were classified as AO/OTA-type A3 in 46 patients (simple), B3 in 18 (including wedge fragment) and C fractures in 7 patients (comminuted). The average DASH score was 8 points (0 to 54) and 72% reported no pain. Both rotation and wrist flexion/extension were 91% of the uninjured side; grip strength was 94%. There were small, but significant differences in rotation (151 versus 169 degrees, $p = 0.004$) and wrist flexion/extension (123 versus 142 degrees, $p = 0.002$), but not disability between skeletally mature and immature patients. The best predictors of DASH score were pain catastrophizing, pain, ipsilateral injury and grip strength, explaining 55% of the variation in DASH scores. Pain alone accounted for 40% of variation in DASH scores.

Conclusion: Twenty-one years after initial fracture, both skeletally immature and mature patients have limited impairment (averaging over 90% motion and grip strength) and disability after non operative and operative treatment respectively. Patients that were skeletally immature at the time of injury had better motion, but comparable disability. Disability correlated with pain and pain catastrophizing rather than motion.

Disclosure: No significant relationships.

S095 Long-Term Functional Outcome After Perilunate Dislocations and Perilunate Fracture Dislocations

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Introduction: Perilunate dislocations (PLD) and perilunate fracture dislocations (PLFD) are rare injuries and can potentially cause severe consequences for the functions of the hand and delay of treatment has been associated with a poor clinical outcome.[1-2] The aim of this study was to investigate the long term outcomes of a series of 16 PLD-PLFDs which were treated in the University Medical Center Groningen.

Material and Methods: Nineteen consecutive patients were treated for PLD-PLFDs at our institution between August 1996 and June 2009 of which 16 were included in this study and evaluated. Long term functional outcome was assessed by using two functional scoring questionnaires; the Disability of Arm, Shoulder, Hand (DASH) questionnaire and the Patient Rated Wrist/Hand Evaluation (PRWE) questionnaire. The clinical scoring system modified from Green and O'Brien was used to evaluate clinical outcome.[2]

Results: The studied group consisted of 14 males and 2 females with a mean age of 37 years (range 18-45). Injuries where of the dorsal type in 13 cases (81%) and of the volar type in 3 cases (19%). Ten patients (50.63%) had a fracture of which 8 (50%) had a fracture of the scaphoid and 5 patients (31%) had median nerve injury. The follow-up period averaged 55 months (range 9 – 118).

One patient was treated with closed reduction, 3 patients with closed reduction and percutaneous placement of Kirschner wires and 12 patients were treated with open reduction and internal fixation after 11 days (mean, range day 0-133). Three patients received arthrodesis after 32 months (mean, range 16-48).

Mean range of motion was 86° (range 0-153) which was the sum of volar flexion (mean 43, range 0-74°) and dorsal flexion (mean 43°, range 0-79°). The mean DASH score was 18 (range 0-65), and the mean PRWE score was 29 (0-77). The mean score according to the clinical scoring system modified from Green and O'Brien was 58 (0-95).

No significant correlations were found between delay in treatment and outcome variables. Also no significant correlations were seen between clinical outcomes and the presence of a carpal fracture. Significant correlations were found between range of motion and the DASH score (Spearman's $r = -.721$, $p = .002$) and the PRWE score (Spearman's $r = -.691$, $p = .003$).

Conclusion: The results suggest that patients who were treated for PLD-PLFDs have a limited functional outcome after longterm follow up, independent of the delay in treatment or the presence of a carpal

fracture. Furthermore, patients with a limited range of motion after treatment for PLD-PLFDs are more likely to experience significant impairment in daily functioning.

References: 1. Budoff JE. Treatment of acute lunate and perilunate dislocations. J Hand Surg [Am] 2008; 33:1424-1432

2. Herzberg G. Perilunate and axial carpal dislocations and fracture-dislocations. J Hand Surg [Am] 2008; 33:1659-1668

Disclosure: No significant relationships.

VISCERAL TRAUMA

S096 The Influence of Concomitant Injury in Blunt Splenic Trauma on Management and Outcome

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Introduction: The spleen is the most frequently injured organ in blunt abdominal trauma.^{1,2} The last two decades non-operative management (NOM) of blunt splenic injuries in hemodynamically stable patients has become the treatment of choice.³ Appropriate patient selection is the most important element of NOM. Little is known about the influence of associated injury on management and outcome.

Material and Methods: From a prospectively filled trauma database retrospectively all hemodynamically stable patients with a traumatic spleen injury presented at a Dutch level I trauma centre between January 2000 and September 2009 were selected. Patient demographics, ISS, GCS, systolic blood pressure at arrival, concomitant injury, management and outcome were reviewed. Statistical significance was determined by Fisher's exact test or Student's t test. Significance was attributed to a p value of less than 0.05.

Results: A total of 71 patients (53 men and 18 women) with a mean age (s.d.) of 36.3 (18.5) were identified. NOM was attempted in 53 of 71 patients. The mean ISS of the patients treated surgically was 25.1 (9.3) and 19.6 (12.0) for the non-operatively treated patients ($P = 0.084$). Mean age, gender ratio, ISS, GCS, haemoglobin and systolic blood pressure at arrival did not differ significantly.

The failure rate of NOM was 23 per cent (12 of 53 patients). Failure of NOM was significant associated with small additional intraperitoneal and thoracic injury. In the presence of thoracic injury failure of NOM was seen in 9 of 22 patients, while in the absence failure of NOM was 3 of 31 patients. The mean AIS(s.d.) of thoracic injury patients was 3.3(0.8). Significant more complications occurred in patients with accompanying thoracic injury 1.1(1.2), versus 0.4(0.8) without thoracic involvement. Length of stay in hospital (LOS) and on the intensive care unit were both prolonged in the presence of thoracic injury. Prolonged LOS was also seen in concomitant gastric, diaphragmatic and femur injuries. There was no mortality in both groups.

Conclusion: Non-operative management was attempted in 53 of 71 (74%) patients. No mortality occurred in both (NOM and OM)

groups. The failure rate of NOM was 23 percent. Additional intra-peritoneal as well as thoracic injury may predict failure of NOM.

References: 1 Cox EF. Blunt abdominal trauma. *Ann Surg* 1984 Apr;199(4):467-74. 2 Davis JJ. Diagnosis and management of blunt abdominal trauma. *Ann Surg* 1976 Jun;183(6):672-8. 3 Richardson JD. Changes in the management of injuries to the liver and spleen. *J Am Coll Surg*. 2005 May;200(5):648-69

Disclosure: No significant relationships.

S097 The Influence of Concurrent Intra- and Extra-Abdominal Lesions on Morbidity and Mortality in Patients with a Liver Injury

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Introduction: The management of traumatic liver injuries has changed in the last decades to a higher degree of non-operative treatment. Several studies have shown the effective results of this approach especially in low grade injuries in relative hemodynamic stable patients. However, many patients who suffer traumatic liver injuries have concurrent injuries, which may be responsible for serious morbidity and part of the mortality.

Material and Methods: A retrospective study involving 47 consecutive patients above the age of 15 years presented at our traumacentre during the period February 2004 till August 2009 with a liver injury. All patients were managed accordingly to ATLS principles.

Results: The study group consisted of 28 males and 19 females. There average age was 45 years (range 15 -87). The most important causes of injury were in 51% traffic related, 23% penetrating and in 15% caused by fall from height. Low grade liver injuries grade 1 and 2 were seen in 51%. A total of 22 patients underwent a laparotomy. Eleven patients underwent an angiography. Seventy-nine percent of the patients had on average five extra injuries. Fifty-one percent of patients had more than one intra-abdominal injury. A total of 44 complications were seen in 22 patients of the surviving group. They consist of 26 extra-abdominal complications and 16 intra-abdominal complications and 2 liver-related complications. Mortality rate was 15% in the whole study group. Four patients (9%) died early due to their liver injury. The cause of death in the other patients was not related to the liver injury but to the concurrent injuries.

Conclusion: Nearly 79% of patients with a liver injury also have concurrent intra-abdominal or extra-abdominal injuries. Morbidity and mortality are strongly influenced by these injuries and the management of these injuries should also be given generous attention by the trauma surgeon.

References: Heuer M, Taeger G, Kaiser GM, Nast-Kolb D, Kuehne CA, Ruchholtz S, Lefering R, Paul A, Lendemans S; Trauma Registry of the DGU. Prognostic factors of liver injury in polytraumatic patients. Results from 895 severe abdominal trauma cases. *J Gastrointest Liver Dis*. 2009 Jun;18(2):197-203. Ckamatal P, Kupka P, Fuksa Z, et al. Liver trauma usually means management of multiple injuries. *Int Surg*. 2008 Mar; 93(2): 72-77

Disclosure: No significant relationships.

S098 Surgical Treatment of Diaphragmatic Injuries, due to Penetrating Thoraco-abdominal Firearm and Stab Wound Injuries

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Introduction: Penetrating thoraco-abdominal firearm and stab wounds are frequently responsible for acute traumatic rupture of diaphragm, increasing number of multiple organ injuries and causing higher mortality.

Material and Methods: We retrospectively reviewed charts of 29 patients with acute traumatic rupture of diaphragm (aTRD) from 151 patients due to penetrating thoraco- abdominal firearm and stab injuries, surgically treated between January 2003-October 2009 at University Clinical Centre of Kosova, Surgical Department in Prishtina. We reviewed records of patients from admission, operative protocols, laboratory, diagnostic results and images. We reviewed age, sex, traumatic rupture of Diaphragm, associated thorax, abdominal organ injuries, and surgical approach.

Results: 151 patients were included in our study (92 firearm-group F and 59 stab -group S, both with thoraco-abdominal injuries). F group consisted of 13 female and 79 males, average age is 32.4 years, STDEV:15.1; median:28; S group comprised 5 female and 59 male, average age is 27.7 years;STDEV:11.6;median:24. Acute TRD was presented in 16/92pts (17.4%) in F group, with average age 36,5 years, respectively in 13/59 pts (22.03%) in S group with average age of 32.1 years. Multiple organ injuries were recorded in both group. F group with aTRD has higher rate of gastric injuries (31.25%);liver (43.75%);colon (25%); spleen (31.25%) compared with S group with 23.1%; 23.1%;15.4% respectively 23%. Mortality was higher in F group with acute TRD (18.7%), compared to S group S, without mortality, because of hypovolemia, multiple organ injuries with higher severity score, liver injuries and acute abdomen.

Conclusion: Penetrating thoraco abdominal injuries carry high risk and suspicious of acute TRD. Younger age group is inflicted Early diagnosis and immediate surgical proper treatment may play a preventive role in reducing mortality, especially at multiple organ injuries. The abdominal surgical approach is more favorable for aTDR treatment.

References: Manlove Ch, Baronovfcy ID: Traumatic rupture of both leaves of the diaphragm. *Surgery* 37(3):461-462, 1955 Asensio JA, Demetriades D,Rodriguez A: Injury of the diaphragm,Mattox KL,Feliciano DV,Moore EE(red).Trauma.new York: McGraw-Hill, pp603-631,2000

Disclosure: No significant relationships.

S099 Minimal Invasive Treatment in Penetrating Truncal Injuries: First Approach

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Introduction: Mininvasive treatment (MIT) is a well recognized indication for patients with blunt trauma, but its use for pene-

trating injuries (PI) is still controversial, especially for truncal wounds.

Material and Methods: To describe the population with penetrating truncal injuries (PTI) managed with MIT and to suggest guidelines for its indication.

After defining the anatomic truncal landmarks, the following variables were analyzed: demographic, traumatic mechanism, scoring, imaging diagnostic studies, treatment and outcome.

Results: Between 01/01/09 - 31/10/09, 186 trauma patients were hospitalized, 51/186 with PI (27.4%), of them 36/51 presented PTI (70.6%) where MIT was performed in 13/36 (36.1%), representing our study group. All were men, with a mean age of 30.4 years old. Stab wounds were observed in 9/13 patients (69.2%). Mean RTS and ISS was 12 and 9.1 respectively. All patients were studied with Rx, Ultrasound (US) and computed tomography (CT) which confirmed the injuries. Pleural drainage was the unique treatment indicated and no mortality was registered.

Conclusion: In our series, PTI represented 70.6% of the hospitalized PI. All were young men and were principally done by stab wounds. The favourable scoring, made a complete study of the patients through Rx, US and CT scan, possible.

The diagnose of minor injuries on the trunk was managed with MIT in 36.1% of the cases, with good results.

The assessment of the traumatic mechanism and its trajectory, evaluation of the hemodynamic status of the patient and the rational use of diagnostic imaging studies are essential factors to indicate MIT in such context.

Disclosure: No significant relationships.

S100 Multiple Embolisation for the Treatment of Abdominal and Pelvic Trauma

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Introduction: Many investigators have documented the usefulness of transcatheter embolisation (TAE) for arterial bleeding caused by blunt solid organ injury or pelvic fracture. The goal of this work is to evaluate the results of multiple embolisation in a same patient in case of severe abdominal and pelvic injuries.

Material and Methods: From the 08/01/2003 to the 30/11/2008, 7 patients (5 Males, 2 Females), mean age 29 ± 17 years with an severe abdominal trauma had multiple organs embolization (5 patients: 2 organs, 2 patients : 3 organs) for acute traumatic hemorrhage in two level one trauma centers (University Hospitals of Grenoble (Alpes Trauma Centre) and University hospital of Bordeaux). 5 to the six had signs of severe hemorrhagic shock at the moment of admission (Systolic TA ≤ 9). Five patients underwent TAE of two regions (4 liver, 3 spleen and 2 kidney). Two patients underwent TAE of three regions (2 liver, 1 spleen, 2 pelvic fracture and 1 ribs)

Results: Embolization stopped hemorrhage in all cases. There was no post-procedures death. 5 complications specific to the procedures happened: pseudo-aneurysm of the renal artery (one case), acute ischemic cholecystitis (one case), and fever (3 cases).

Conclusion: Non surgical management using transcatheter arterial embolisation (TAE) can be performed safely even for patients with blunt multiple trauma who are in hemorrhagic hypotension and that were unlikely to be saved by surgery.

References: 1) Hagiwara A, Yukioka T, Ohta S et al. AJR. Am J Roentgenol. 1996;167:159-166 2) Nix JA, Constanza M, Daley BJ et al. J Trauma. 2001;50:835-842

Disclosure: No significant relationships.

S101 Incidence and Management of Mesenteric Injuries in a Series of 501 Polytrauma Patients

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Introduction: Mesenteric injuries can occur in polytrauma, associated or not with bowel injuries. They require a specific diagnostic and therapeutic approach, that should be evaluated.

Material and Methods: Retrospective study (2004-2009) of 501 patients admitted to our trauma center for one or multiple lesions involving life-threatening. A whole-body CT was performed in all patients stabilized. CT-scan was repeated depending on the clinical course or in the presence of lesions on the initial scanner. This approach allowed the diagnosis of 19/501 (3.8%) mesenteric injuries in relationship with blunt abdominal trauma (14 men and 5 women, average age 41 years). The Injury Severity Score mean baseline was 21.2 (4-50).

Results: The mesenteric injuries visualized on initial CT-scan were mesenteric vascular beading or extravasation in 6 cases, and mesenteric infiltration or hematoma in 13 cases. Associated abnormalities of the gastrointestinal tract (thickening, abnormal enhancement, perforation) were present in 11/19 cases (58%). Nine patients underwent surgery (26%), 6 patients in the early hours, and 3 others after a delay of more than 24 h. Indication for surgery was hemodynamic instability in 4 cases and suspicion of bowel perforation in 5 cases. In total, intestinal perforations were found in 8 patients. Three patients (15.8%) died of associated injuries. No false positive scan has led to unnecessary surgery. However, the negative predictive value of initial CT was 75% for intestinal associated lesions.

Conclusion: The mesenteric injuries in blunt polytrauma patients are uncommon but serious. The whole body scanner is a powerful tool for the diagnosis of these mesenteric lesions. Conservative treatment is feasible but a clinical and paraclinical reassessment is essential for early detection of intestinal lesions initially undiagnosed, or aggravation of initial lesions.

Disclosure: No significant relationships.

S102 Body-packers: Surgical Implications of an Increasing Phenomenon in Our Emergency Department

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Introduction: Drug smuggling by gastrointestinal concealment, body-packers, is an increasing problem in developed countries. Although conservative treatment is usually successful in most cases, some of these patients suffer complications such as obstruction, gastrointestinal perforation or massive drug intoxication due to a leaking package. Despite an urgent surgery and a careful management in the ICU, morbidity and mortality remain high. Our aim was to assess the outcomes of conservative and surgical management of these patients in our hospital, the referral centre for this entity in Madrid.

Material and Methods: Retrospective analysis of all patients admitted to our hospital between 2000 and 2008 with a body-packer diagnosis. Cases were collected from the Hospital Registry and the charts were reviewed. Data were analysed with the SPSS statistical software.

Results: During the study period 549 body-packers were admitted to our Hospital. The mean age was 32,3 (SD 8,7) years, and 81% were males. The majority of these patients carried cocaine. In 223 (40,6%) patients drug levels were elevated in urine, and this rate was of 48% in patients who suffered complications, without statistical difference. Conservative treatment was successful in 524 (96%) cases, with a median length of stay of six days (IQ:4-8). 27 patients suffered complications: 16 obstructions, 9 massive intoxication due to leaking packages and 2 hollow viscus perforations. We performed 23 urgent laparotomies, with a morbidity rate of 43,4%. Twelve patients were admitted to the ICU with median length of stay of 2 days (IQ: 2-3). Two deaths were reported, both of them due to a cardiac arrest following a massive cocaine intoxication, with no chance of surgical treatment.

Conclusion: Conservative treatment of body-packers is safe, with a success rate of 96% in our experience, in spite of having high drug levels were in urine. When surgery is needed it carries a high morbidity (43%). Mortality is uncommon, and is usually related to massive intoxication from a leaking package.

References: 1.- Traub SJ, Hoffman RS, Nelson LS. Body-Packing-The internal concealment of illicit drugs. *N Eng J Med*, 2003;349:2519-26. 2.-Veyrie N, Servajea S, Aissat A, Corigliano N, Angelakov C, Bouillot JL. Value of a systematic operative protocol for cocaine body packers. *World J Surg*, 2008 Jul;32 (7):1432-7. 3.- de Beer SA, Spiessens G, Moi W, Fa-Si-Oen PR. Surgery for body packing in the Caribbean: a retrospective study of 70 patients. *World J Surg*, 2008 Feb;32(2):281-5. 4.-van Geloven AA, van Liende KP, Gounna DJ. Bodypacking, an increasing problem in The Netherlands: conservative or surgical treatment?. *Eur J Surg*, 2002;168(7):404-9.

Disclosure: No significant relationships.

S103 Risk Factors for Prehospital Death After Non-gun Shot Wound Penetrating Injury. An Autopsy Audit

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Introduction: Analysis of pre- and in-hospital traumatic deaths, after trauma from non-GSW penetrating injuries, may contribute to optimization of trauma management, outcome improvement, redistribution of resources.

Material and Methods: Data from 1996-2001 were obtained from the Athenian Forensic Service; regarding fatalities from cut and pierce injuries. Epidemiologic data (age, sex, nationality, co-morbidities), location of incident (house or work and city or urban), intension of assault, toxicology status, transportation method, time until expiration, location of death, ISS, anatomical site of injury, operations and complications were analyzed. Pre-hospital (found dead and dead on arrival) were compared with in-hospital (ED, OR, ICU, ward) deaths. Logistic regression was utilized to identify risk factors related to pre-hospital deaths.

Results: 144 fatalities were identified. 118 (82%) comprised the pre-hospital fatalities group, vs 26 (18%) the in-hospital deaths group. Parameters with p-value less than 0,2 were included in the logistic regression: Age (44 y/o vs 36 y/o, p = 0,04), urban incident (25% vs 8%, p = 0,02), ISS (33 vs 26, p = 0,02), incident before 1998 (49% vs 35%, p = 0,19), house incident (21% vs 8% p = 0,16). From these, Age (above 40 y/o) and ISS (more than 34) were identified as independent risk factors for pre-hospital death.

Conclusion: In earlier years (1996-1997) pre-hospital fatalities were more frequent (although not statistically significant), which may reflect improvement of trauma organization in recent years (1998-2001). Domestic (may related to delay due to victim's solitude) and urban environment (inexperienced personnel, delay due to referral to another hospital) incidents lead more frequently in pre-hospital death. Age and ISS as indicators of physiologic reserve and severity of injury were independent predictors of fatality before the victim reaches hospital.

References: 1. Iordanis N Papadopoulos, D Bukis, E Karalas, S Katsaragakis, S Stergiopoulos, G Peros, G Androulakis. Preventable Pre-hospital Trauma Deaths in a Hellenic Urban Region: An Audit of Pre-hospital Trauma Care. *Journal of Trauma* 1996; 41: 864-869. 2. Iordanis N Papadopoulos, Nikolaos Kanakaris, Stefanos Bonovas, Aristidis Triantafyllidis, Christos Garnavos, Dionisios Voros, Christos Leukidis. Auditing 655 fatalities with pulvic fractures by autopsy as a basis to evaluate trauma care. *Journal of the American College of Surgeons* 2006; 203(1): 30-43.

Disclosure: No significant relationships.

ELBOW

S104 Standard Surgical Protocol to Treat Elbow Dislocations With Coronoid and Radial Head Fractures

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Introduction: The triad of the elbow is a complex traumatic injury. These injuries have traditionally been considered a poor prognosis for the consequences that arise as a secondary instability, stiffness and loss of functional ability. The objective of this free paper is to review from a clinical and radiological perspective our experience with 24 cases.

Material and Methods: We retrospectively reviewed 24 patients with this type of injury. In 8 patients was not carried out a comprehensive treatment of all existing lesions. The coronoid process was not addressed specifically and fractured radial head was removed or and an osteosynthesis was performed. In the remaining 16 were treated by a treatment protocol trying to repair all the damaged structures (coronoid synthesis, radial head arthroplasty/ORIF and ligament repair, at least in the external lateral ligament complex). The median follow-up was 18 months (12-24). The results were evaluated by the scale of May Elbow Performance Score (MEPS), range of mobility, radiographic parameters and complications during follow up.

Results: Patients treated according to protocol in a systematic manner trying to repair all damaged structures had better outcomes in both the radiological point of view as functional, as well as a lower rate of complications. MEPS in these patients the average was 85 points (vs. 62 the other group), the arc of 95° flexoextensión (vs. 60°) and the arc pronosupinación 150° (vs. 105°).

Conclusion: Despite being an injury traditionally associated with poor results, which have been established treatment protocols that try to treat all manner of injured structures involved in the injury outcomes have improved significantly. We think it must be performed a radial head arthroplasty/ORIF (not resection), anchorage/osteosynthesis coronoid process and a ligament repair at least of the external lateral ligament complex. If residual instability results it may be repaired the medial collateral ligament complex and a temporal external fixator may be used.

Disclosure: No significant relationships.

S105 Predictors of Arthrosis After Elbow Trauma

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Introduction: Arthrosis is a common sequela of elbow trauma due to direct cartilage injury, instability, and articular incongruity. Not much has been published regarding risk factors for arthrosis after elbow injury, especially in the long term. Data from multiple long-term follow-up studies of injured elbows provided us with an opportunity to assess the risk factors for post-traumatic elbow arthrosis.

Material and Methods: During a four year period, physical evaluations and health status data were collected during evaluation of patients at various stages of recovery after a complex elbow trauma as part of multiple prospective and retrospective studies at our institutions in the United States and in the Netherlands. One-hundred-and-fifty-six patients (89 males and 67 females) with a mean age of

41 years fulfilled the inclusion criteria. Patients were evaluated at a median of 13.7 years (range, 2 to 34 years) after injury. Radiographs of the involved elbow were evaluated for arthrosis according to the system of Broberg and Morrey.

Results: Eighty of 156 patients (49%) had arthrosis at final evaluation. Significant predictors of arthrosis according to bivariate analysis included type of injury, mechanism, non-operative treatment, duration of follow-up, and country. Multiple logistic regression analysis identified three significant independent predictors of arthrosis: injury type, treatment, and follow-up time.

Conclusion: Factors related to injury severity (injury type) and sub-optimal articular reconstruction (non-operative treatment) predict the development of arthrosis after elbow trauma. Probability of arthrosis increases with time for all injury types and is independent of age, gender, arm dominance, and occupation. At equivalent follow-up, distal humerus fractures and injuries to the capitulum/trochlea are associated with the highest rates of arthrosis.

References: 1. Doornberg J, Ring D, Jupiter JB. Effective treatment of fracture-dislocations of the olecranon requires a stable trochlear notch. *Clin Orthop Relat Res*. 2004 Dec(429):292-300. 2. Doornberg JN, Ring DC. Fracture of the anteromedial facet of the coronoid process. *J Bone Joint Surg Am*. 2006 Oct;88(10):2216-24. 3. Regel G, Weinberg AM, Seekamp A, Blauth M, Tschern H. [Complex trauma of the elbow]. *Orthopade*. 1997 Dec;26(12):1020-9. 4. Ring D. Elbow stiffness associated with malunion or nonunion. In: JB J, editor. *The stiff elbow*. 1st ed. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2006. p. 41-9. 5. Herbertsson P, Josefsson PO, Hasselius R, Karlsson C, Besjakov J, Karlsson M. Uncomplicated Mason type-II and III fractures of the radial head and neck in adults. A long-term follow-up study. *J Bone Joint Surg Am*. 2004 Mar;86-A(3):569-74. 6. Konrad GG, Kundel K, Kreuz PC, Oberst M, Sudkamp NP. Monteggia fractures in adults: long-term results and prognostic factors. *J Bone Joint Surg Br*. 2007 Mar;89(3):354-60. 7. Doornberg JN, van Duijn PJ, Linzel D, Ring DC, Zurakowski D, Marti RK, et al. Surgical treatment of intra-articular fractures of the distal part of the humerus. Functional outcome after twelve to thirty years. *J Bone Joint Surg Am*. 2007 Jul;89(7):1524-32. 8. Lindenhovius AL, Brouwer KM, Doornberg JN, Ring DC, Kloen P. Long-term outcome of operatively treated fracture-dislocations of the olecranon. *J Orthop Trauma*. 2008 May-Jun;22(5):325-31. 9. Lindenhovius AL, Buijze GA, Kloen P, Ring DC. Correspondence between perceived disability and objective physical impairment after elbow trauma. *J Bone Joint Surg Am*. 2008 Oct;90(10):2090-7. 10. Broberg MA, Morrey BF. Results of delayed excision of the radial head after fracture. *J Bone Joint Surg Am*. 1986;68(5):669-74. 11. Hosmer D, Lemeshow S. *Applied logistic regression*. 2nd ed. Wiley J, editor. New York; 2000. 12. Demidenko E. Sample size determination for logistic regression revisited. *Stat Med*. 2007;26:3385-97. 13. Lindenhovius AL, Jupiter JB. The post-traumatic stiff elbow: a review of the literature. *J Hand Surg [Am]*. 2007 Dec;32(10):1605-23. 14. Ring D. Elbow stiffness associated with malunion or nonunion. In: Jupiter JB, editor. *The stiff elbow*. 1 ed. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2006. p. 41-9. 15. O'Driscoll SW. *Elbow Arthritis: Treatment Options*. *J Am Acad Orthop Surg*. 1993 Nov;1(2):106-16.

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S106 Hemiarthroplasty for Comminuted Distal Humerus Fractures of the Elderly

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Introduction: The Purpose of our study was to evaluate the objective and subjective as well as radiographic results after distal humerus hemiarthroplasty for comminuted distal humerus fractures of the elderly.

Material and Methods: Ten female patients were treated with distal humerus arthroplasty due to eight fresh osteoporotic distal humerus fractures and two early failed osteosyntheses of distal humerus fractures. Mean follow-up was 12.1 months (6-23). Mean age was 75.2 years (62-88). All patients were reexamined using the Mayo Elbow Performance Score (MEPS) and Disabilities of the Arm, Shoulder and Hand score (DASH) as well as ap and lateral radiographs of the injured elbow.

Results: According to the MEPS eight patients achieved an excellent, one a good, and one a fair result. The mean DASH was 11.49 (0-44). Flexion averaged 124.5 degrees (95-140), the extension deficit was 17.5 degrees (5-30), pronation 80.5 degrees (60-90) and supination 79.5 degrees (50-90). The following complications were seen: one triceps insufficiency, one ulnar nerve irritation, one wound infection and two cases of heterotopic ossifications. The wound infection could be managed with debridement. No explantation or further surgery was performed. No evidence of loosening, radiolucencies or proximal bone resorption could be detected, whereas one patient developed progressive osteoarthritis of the proximal ulna and radius.

Conclusion: Distal humerus hemiarthroplasty can lead to excellent short-term results in elderly patients. Complications found were minor and reoperation rate was low.

Disclosure: No significant relationships.

S107 Total Elbow Arthroplasty as a Treatment Option in Complex Injuries of the Elbow in Elderly Patients

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Introduction: Severe injuries of the elbow like distal fractures of the humerus, especially in osteoporotic bone, are very challenging for the attending orthopedic surgeon. The aim of the study was to find out if total elbow replacement is an acceptable treatment option in such cases.

Material and Methods: Between March 2005 and January 2009 we implanted 22 Coonrad-Morrey prosthesis in 21 patients. 8 patients had AO type C fractures and were treated with primary implanta-

tion. 14 patients received a secondary implantation including 6 chronic luxations, 5 nonunions, 2 failed osteosynthesis and 1 reimplantation after deep prosthetic infection. The mean follow up was 14 ± 7 months. The functional outcome was measured by using the Mayo Elbow Performance Score.

Results: We had 14 female and 7 male patients with a mean age of 69 ± 6 years. All 21 patients achieved very good results based on the „Mayo Elbow Performance Score“ with a postoperative mean of 97 points (range between 90 and 100 points) with a maximum performance of 100 points. The mean range of motion concerning extension and flexion was 94 degrees (55 to 115 degrees), concerning pronation and supination 144 degrees (100 to 160 degrees). The mean flexion deformity was 19 degrees (10 to 50 degrees), the mean maximum flexion was 113 degrees (90 to 130 degrees). We had two partial ruptures of the triceps tendon, one treated by operative refixation and one conservative, one temporary lesion of the ulnar nerve with complete recovery and one postoperative hematoma which needed surgical treatment. One patient needed revision surgery and resection arthroplasty due to a deep infection, but received a new prosthesis after two months. We recorded no radiographic loosening or other mechanical problems so far.

Conclusion: According to the used “Mayo Elbow Performance Score” all patients achieved a very good functional outcome. Eventhough they all had severe injuries of the elbow. With modern types of elbow prosthesis the rate of complications and revision surgery is quite low. Our findings indicate that total elbow arthroplasty should be considered as an additional treatment alternative. Patients with a lower functional demand and of higher age benefit most from a prosthesis. For younger patients preservation of the joint should be achieved as far as possible.

References: Kraus E, Harstall R, Borisch N, Weber D. 2009. [Primary total elbow replacement for complex intra-articular distal humerus fractures]. Unfallchirurg, 112 (8):692-698. Morrey BF. 2009a. Total elbow arthroplasty did not differ from open reduction and internal fixation with regard to reoperation rates. J Bone Joint Surg Am, 91 (8):2010. Morrey BF. 2009b. Current concepts in the management of complex elbow trauma. Surgeon, 7 (3):151-161. Patton MS, Johnstone AJ. 2008. The role of total elbow arthroplasty in complex distal humeral fractures. Eur J Trauma Emerg Surg, 34:99-104.

Disclosure: No significant relationships.

S108 A Comparison of Anatomical Fit Between Six Different Radial Head and Neck Plates

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Introduction: Bulky implants may lead to significant soft tissue irritation after plate osteosynthesis of radial head and neck fractures. The purpose of our study was to determine the anatomical fit of so called precontoured radial head plates.

Material and Methods: Twenty-two radii of human cadaver were stripped of soft tissues. Six radial head and neck plates were investigated: 1. Medartis Radial Head Buttress Plate (MBP) 2. Medartis Radial Head Rim Plate (MRP) 3. Synthes Radial Head Plate (SHP) 4. Synthes Radial Neck Plate (SNP) 5. Acumed Radial Head Plate (AHP) 6. Wright Radial Head Plate (WHP). Each plate was applied to each radial head at the place of best fit within the safe zone. Five parameters of anatomical fit were tested: 1. Plate-to-bone contact: Plates were divided into 11 areas. Plate-to-bone distances were measured at each area with simultaneous consideration of plate thickness. 2. Plate contact judged by 3 different observers: The anatomic fit of each plate was judged from 3 different views. A judgment was made by a special score of points. 3. Pin-subchondral bone distance: Screw-contact/distance to the subchondral zone will be assessed in lateral radiographs. 4. Plate-to-bone contact after adjustment of the plates: Plates which can be adjusted at the different radii will be adjusted to their best fits. Afterwards plate-to-bone distances will be measured again at the 11 different areas of each plate. 5. Reevaluation of the adjusted plate contacts by the same 3 observers

Results: Bone-to-plate distance for the MBP was 2,06 in mean (1,66 - 2,69 mm), for the MRP 2,28 (1,83 - 3,14 mm), for the SNP 2,51 (2,08 - 3,47 mm), for the AHP 2,70 (2,24 - 3,42 mm), for the SHP 3,05 (2,46 - 4,19 mm) and for the WHP 3,12 (2,7 - 3,9 mm). The evaluations by the 3 observers showed also clear differences. The more points one plate achieved the better the assessed anatomic fit. MBP achieved 65 points, SNP 32 points, MRP -21 points, AHP -26 points, SHP -114 points, WHP -137 points. The study is not completed yet. We worked out the first two parameters so far. The other three parameters are in process.

Conclusion: Our results, that have been collected so far, show considerable differences of anatomic fit and plate-to-bone distance. The MBP and MRP showed the lowest profile by objective measurements, the SNP and AHP showed a moderate profile and the SHP and WHP the bulkiest profile. The subjective assessments demonstrated the best fit for the MBP as well, a good fit for the SNP, moderate fit for MRP and AHP and a poor fit for SHP and WHP. Further results will be presented. Low profile and perfect anatomic fit of radial head and neck plates might lead to reduction of soft tissue irritations in clinical use.

Disclosure: No significant relationships.

S109 Radial Head Morphology: Variability Necessitates Modularity!

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Introduction: It is not always possible to reconstruct complex radial head fractures. As non-anatomical reconstruction and healing disturbances result in loss of motion and severe post-traumatic arthritis of the elbow joint, radial head resection has been proposed for these cases. However secondary overload of the lateral facet of the humero-ulnar joint (with consequent arthritis), instability (especially in the presence of medial collateral ligament injury), painful antero-posterior instability of the radial stump, and radial shortening (in Essex-Lopresti lesions) with wrist pain can be the result. Radial head arthroplasty widely is proposed as prevention of these complications.

However as we demonstrated in a systematic review of the literature, radial head arthroplasty has equally high secondary arthritis rates as radial head resection. The complex anatomy of the radial head, articulating both with the capitellum and the proximal ulna is not reproduced by most contemporary radial head prostheses.

Material and Methods: We describe the complex radial head anatomy based upon an analysis of 20 MRI-TMs of the elbow performed in healthy volunteers under standardised situations. We describe the next variables: radial head shape and diameter at the most proximal part of the PRUJ (proximal radio-ulnar joint) radial head shape and diameter at the midpoint of the PRUJ radial head height medial and lateral depth of the radial head through offset of the radial head TMs through relative to the center of the radial head offset of the radial head TMs through relative to the axis of the radius offset of the radial head relative to the axis of the radius angulation of the radial neck to the axis of the radius We compare these parameters to the available radial head prostheses.

Results: There is a high variability of the different parameters and no relation between all of the parameters could be determined. The existing radial head prostheses do only reproduce the anatomy to a limited extent.

Conclusion: The high rates of post arthroplasty arthritis can be related to the non-anatomical shape of the existing designs. As the proximal radius articulates both with the capitellum and the proximal ulna, a precise reconstruction of both joints is a necessity to avoid maltracking and/or edge contact in both joints. Given the high variability this only can be realised using a theoretic modular prosthesis that allows for reconstruction of the synchronisation between both joints.

Disclosure: No significant relationships.

S110 Long-term Follow-up Results of Bipolar Prosthesis in Comparison to Internal Fixation for Radial Head Fractures

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Introduction: Treatment of dislocated radial head fractures of Mason type II to IV remains controversial. Resection of the radial head yields known risks both at wrist and elbow. These can be minimized either by internal fixation with screws or plates or by prosthetic replacement of the radial head. This retrospective study compares clinical long-term results of these three methods.

Material and Methods: Between 2000 and 2007, 15 patients were treated with bipolar prosthesis, 16 with plates and 20 by osteosynthesis with screws ($\varnothing 2 \pm 0.56$ screws). The average age of the patients was 41 ± 16 years, with 67% male and 33% female patients. We evaluated the clinical follow-up results using Broberg and Morrey Score, as well as DASH and SF-36. The range of motion was examined in comparison to the opposite site in a follow-up examination.

Results: We examined 13 prosthesis patients (mean follow up 43 ± 21 months, Mason II: 1, Mason III: 9, Mason IV: 3), 11 patients treated with plates (mean follow up 40 ± 19 months, Mason II: 1,

Mason III: 5, Mason IV: 5) and 12 patients treated with screws (mean follow up 45 ± 23 months, Mason II: 3, Mason III: 5, Mason IV: 4). We found no significant differences ($p > 0.05$) in the deficit of the range of motion.

Flexion: Screws $6 \pm 10^\circ$, prosthesis $12 \pm 13^\circ$, plate $8 \pm 13^\circ$

Extension: Screws $7 \pm 11^\circ$, prosthesis $13 \pm 10^\circ$, plates $16 \pm 18^\circ$

Pronation: Screws $17 \pm 19^\circ$, prosthesis $10 \pm 14^\circ$, plates $25 \pm 32^\circ$

Supination: Screws $6 \pm 16^\circ$, prosthesis $13 \pm 19^\circ$, plates $27 \pm 30^\circ$

According to elbow functional evaluation criteria by Broberg and Morrey, we found excellent and good results in 60% of all patients treated with screws, in 58% of all patients treated with prosthesis and in 50% of all patients treated with plates ($p > 0.05$)

The average DASH score of patients treated with screws was 11 ± 17 points, of patients treated with prosthesis 19 ± 17 points and of patients treated with plates was 16 ± 18 points (no significant differences, $p > 0.05$).

The physical and mental component of the SF-36 score was at the time of follow-up within the normal range at all patients (physical component: screws 51 ± 9.7 , prosthesis 46 ± 8.3 , plate 52 ± 6.2 ; mental component: screws 54 ± 7.9 , prosthesis 56 ± 6.6 , plate 56 ± 4.5). In the subcategory of physical functioning, screws performed better than prosthesis ($p < 0.05$). No other items of SF-36 were significantly different ($p > 0.05$).

Conclusion: According to our results osteosynthesis with only screws seem to be the best of the three studied methods. Radial head prosthesis replacement yields better functional results than treatment with plates. It must be considered that prosthesis replacement of the radial head has the long-term risk of loosening, especially in young and active patients. Plates showed worse clinical results especially in rotation of the forearm even after removing the plate in 7 patients.

Disclosure: No significant relationships.

S111 Is Angular Stable Osteosynthesis of the Olecranon More Economical than Traditional Treatment?

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Introduction: Although tension band wiring is considered as the gold standard in the treatment of simple olecranon fractures and olecranon osteotomies, the complication rate is high (delayed healing in up to 15% of cases, hardware migration 13%). In an historical series using anatomical preshaped LCP plates, we could lower the rate of healing disturbances, but the volume of the implant did make hardware removal necessary in the majority of patients. The LCP 3,5 mm Hook plate is a low volume angular stable compression plate, designed for the treatment of simple fractures and osteotomies of the olecranon. In this study we want to evaluate the early results of using this new device for the treatment of acute fractures and osteotomies at a level 1 trauma centre.

Material and Methods: We prospectively include all patients treated by LCP 3,5 mm hook plate between and. 6 months results considering range of motion (as measured by), MEPS (Mayo Elbow Performance Score), complications and radiographic results are presented. We perform a cost analysis of primary operation using the

different implants available, length of stay and time off work. We also perform a cost analysis for reoperation because of delay in union

Results: We included 21 patients. Average age is 55,6 years (range 17-83). There were 11 female and 10 male patients. At 6 months average extension deficit was 12° , the average flexion 130° . There was no substantial loss of pro-supination. All fractures but one united anatomical (early loss of reduction, but patient refused reoperation). There were 3 complications: 1 early loss of reduction (treated conservatively), 1 CRPS (complex regional pain syndrome) and 1 arthrofibrosis necessitating implant removal). Because of symptomatic hardware two additional hardware removals have been performed. According to the Mayo Elbow Performance Score all but 1 patient scored good to Based upon the cost analysis the predicted average cost per patient is significantly lower in the hook plate group as compared to the tension band and anatomical preshaped plate group.

Conclusion: Although still a limited series, the early results of this implant are very promising. We document ranges of motion which are comparable to those described previously in tension band wiring or anatomical plating, but at lower complication and reoperation rates. Based upon an analysis of the cost of treatment and of reoperation we advocate the routine use of the olecranon hook plate in the treatment of simple olecranon fractures and osteotomies.

Disclosure: No significant relationships.

ANKLE-FOOT

S112 Treatment of Displaced Intra-articular Calcaneal Fractures With Closed Reduction and Percutaneous Screw Fixation

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Introduction: Surgical treatment of displaced, intra-articular fractures of the calcaneal bone is a standard procedure in many institutions. To avoid soft tissue complications, several minimally invasive procedures have been introduced. The aim of this study was to assess our practice of percutaneous treatment according to Forgon and Zadrevetz in patients with displaced intra-articular calcaneal fractures.

Material and Methods: All patients who underwent percutaneous screw fixation according to Forgon and Zadrevetz between 1998 and 2006 were selected. Postoperative infectious complications were registered. During follow-up, pain, functional outcome, range of motion and change in footwear were evaluated with the use of the American Orthopedic Foot and Ankle Society (AOFAS) score and the Maryland Foot Score (MFS). All patients also completed a general health status form (SF36) and a Visual Analog Scale (VAS) for patient satisfaction. Subsequent subtalar arthrodesis and removal of irritating screws were performed when indicated.

Results: We reviewed 37 patients with 39 displaced intra-articular calcaneal fractures with a follow-up period of at least 24 months. Wound infections were observed in five cases, of which two infections (5%) remained superficial, and three resulted in deep wound infections (8%). At a mean follow-up of 66 months (range 26-128), the mean AOFAS score and the MFS were 84 and 87 points out of 100, respectively. The mean score on the SF-36 was 77 points and the mean score on the (satisfaction) VAS was 7.9 points out of 10. Twenty-nine patients (79%) were able to wear

normal shoes. At follow-up, subtalar arthrodesis was performed in two patients (5%), while 17 patients (44%) underwent uncomplicated removal of hardware for mechanical discomfort. No substantial correlation was found between the severity of the fracture (Sanders classification) or the quality of the reduction with functional outcome parameters.

Conclusion: We consider this technique to be an excellent alternative in the treatment of displaced intra-articular calcaneal fractures in most cases, despite the high rate of additional screw removals.

References: Forgon M. Closed reduction and percutaneous osteosynthesis: technique and results in 265 calcaneal fractures. In: Tschern H, Schatzker J, editors *Major fractures of the pilon, the talus, and the calcaneus* Berlin: Springer-Verlag 1993;207-13. Kitaoka HB, Alexander IJ, Adelaar RS, Nunley JA, Myerson MS, Sanders M. Clinical rating systems for the ankle-hindfoot, midfoot, hallux, and lesser toes. *Foot Ankle Int* 1994;15:349-53.

Schepers T, Schipper IB, Vogels LM, Ginai AZ, Mulder PG, Heetveld MJ, Patka P. Percutaneous treatment of displaced intra-articular calcaneal fractures. *J Orthop Sci* 2007;12:22-7.

Disclosure: No significant relationships.

S113 Calcaneal Fractures: Indirect Reduction and External Fixator with Ilizarov Fixator

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Introduction: Our purpose was to evaluate the use of indirect and closed reduction with Ilizarov external fixator in intra-articular calcaneal fractures.

Material and Methods: In a period of 5 years (2004-2008), 26 patients with 29 intra-articular fractures of calcaneus (eighteen type III and eleven type IV according to Sanders classification) were treated with the Ilizarov fixator. Twenty-one patients were male and five female. The average age was 45 years (range 22 – 67 years). Five fractures were open. Fractures were evaluated by preoperative radiographs and CT scans. Restoration of the calcaneal bone anatomy was obtained by closed means using minimally invasive reduction technique by Ilizarov fixator. Arthrodiastasis and ligamentotaxis, and closed reduction of the subtalar joint were performed in 24 cases. In 5 cases the depressed posterior calcaneal facet was elevated by small lateral incision and stabilized in frame by wires. Postoperatively, partial, early weight bearing was encouraged in all patients.

Results: The mean follow-up period was 2,1 years (range 1 - 4 years). The AOFAS Ankle – Hindfoot Score, and physical examination were used in functional evaluation. The average score was 77,4 (range 70 - 90). Seven patients had limited degenerative radiological findings of osteoarthritis about the subtalar joint and three of them had painful subtalar movement. Two of the patients complained of heel pad pain. Nine patients had grade II pin tract infections and were detected from a total of 258 wires. No secondary reconstructive procedures, including osteotomies, subtalar fusions, or amputations, have been done.

Conclusion: Indirect closed reduction of calcaneal bone anatomy and arthrodiastasis of subtalar joint with Ilizarov external fixator is a viable surgical alternative for intra-articular calcaneal fractures.

References: 1. A. Saridis, C. Matzaroglou, A. Kallivokas, M. Tyllianakis, P. Dimakopoulos. Management of intraarticular calcaneus fractures with ilizarov fixator. 65th Annual Congress of the Hellenic Association of Orthopedics and Traumatology, abstract book pp 64, Thessaloniki, 2009.

Disclosure: No significant relationships.

S114 The Inter-surgeon Variation to the Open Lateral Approach of the Calcaneus

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Introduction: Objective: To determine the inter-surgeon variation in the Open Lateral Approach for intra-articular fractures of the Calcaneus (OLAC). In the Netherlands the treatment of choice is Open Reduction and Internal Fixation¹. In the OLAC evidence based teaching of the skin incision is important. This represents the basic surgical dilemma of creating a good exposure versus sparing tissue. One of the most common complications is post-operative pain caused by iatrogenic lesion of the sural nerve².

Material and Methods: Dutch surgeons (N = 23) were asked to draw two incisions for an OLAC on embalmed human specimen (N = 46). They also filled out a questionnaire of their experience. All incisions were photographed and digital measurements were taken. Each incision was compared to the gold standard on 4 criteria. Incisions should not be closer than two-thirds of the distance between: 1) Distal tip of the lateral malleolus and the Achilles tendon. 2) Distal tip of the lateral malleolus and the sole of the foot. 3) Proximal top of the lateral malleolus and the Achilles tendon. The distal incision: 4) Should not be located more than 5 mm superior to the tuberositas of the fifth metatarsal. A new analysis method, CASAM (Computer Assisted Surgical Anatomy Mapping), was used to depict all drawn incisions into one computed leg with average dimensions.

Results: Surgeons on average performed 4.8 (0-20) OLAC's per year and had 13.4 (0-27) years of experience. Form and place of the incisions were highly variable. Of 41 incisions, 23 were J- and 18 L-shaped. Nine incisions were conform the gold standard. On the 4 criteria above, nine incisions showed 1 mistake, ten incisions showed 2, eight incisions showed 3 and five incisions showed 4 mistakes. There was no correlation between number of mistakes and number of procedures per year or years of experience (Spearman correlation: 0.03 and -0.04 respectively) The median of the mistakes for L-shaped incisions was 1 (IQR = 2) and 2 (IQR = 2) for J-shaped incisions (p = 0.017, Mann-Whitney). The Spearman correlation between the mistakes for the two incisions drawn by each surgeon was 0.55.

Conclusion: Conclusions: Inter-surgeon variation of incision lines was high and since the number of mistakes per incision was not correlated to the surgeon's experience, CASAM can be useful in two ways: 1) Pre-operative planning using CASAM, might assist the surgeon in determining a 'tailor made' safe zone in each patient. 2) For educational purposes CASAM is able to compare a student's incision with the gold standard or the computed location of the sural nerve, thus providing personal feedback.

References: 1. Schepers T et al. Current concepts in the treatment of intra-articular calcaneal fractures; Results of a nationwide survey. 2. Poeze M et al. The relationship between the outcome of operatively treated calcaneal fractures and institutional fracture load. A systematic review of the literature.

Disclosure: No significant relationships.

S115 Precision Analysis of the Sustentaculum Tali Screw Placement in Calcaneus Fractures. Different Navigation Procedures Compared to the Conventional Technique

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Introduction: A precise sustentaculum tali screw placement is crucial for the fixation strength of operatively treated calcaneus fractures, as shown in biomechanical studies. Due to the complex anatomic shape of the calcaneus and the limited visualization of the sustentaculum tali fragment via the common lateral approach, the exact screw positioning is demanding and a bright knowledge of the surgeon is mandatory. With the introduction of navigation procedures an increased precision of implant positioning could be achieved for different applications, as reported for pedicle- and iliosacral screw placement. The aim of this study was the evaluation of different navigation procedures compared to the conventional technique for the placement of the sustentaculum tali screw.

Material and Methods: 32 sustentaculum tali screws were placed via a standard lateral approach in artificial calcanei with a prefabricated soft tissue envelope. We used different navigation techniques: Group I: 2D-based fluoroscopic navigation Group II: 3D-based fluoroscopic navigation Group III: Fluoro-Free navigation compared to the standard procedure without navigation (Group IV). For each screw the time of procedure and time of fluoroscopy was measured. The precision was evaluated in postoperative CT scans.

Results: No x-ray exposure was necessary for the standard procedure and the Fluoro Free navigation, whereas 17 ± 1.03 and 66.8 ± 0.9 s of fluoroscopy time were needed for the 2D- and 3D-based fluoroscopic navigation. Significant differences were observed for the mean procedure time: 1.26 ± 0.05 (Group IV), 3.49 ± 0.26 (Group III), 13.5 ± 0.49 (Group I) and 19.04 ± 1.41 min (Group II). No significant differences were seen for the precision with one mal-placed screw in each group. Whereas for the image based navigation procedures wide experience in computer assisted surgery was necessary, the Fluoro Free navigation procedure could easily used without that experience, due to a simplified and self-explanatory workflow.

Conclusion: All three navigation procedures increase the intraoperative orientation for the placement of the sustentaculum-tali screw, but significant differences of precision compared to the standard

technique could not be observed in our experimental set up. Potential reasons are a visual and tactile memory effect, despite a randomized order of drillings and a better visualization of the osseous structures in the used artificial model. In clinical situations a lack of surgical routine for this rare injuries and a limited display of anatomic landmarks exist, making all of the evaluated navigation procedures to a helpful tool. If the fracture reduction is controlled intraoperatively by an 3D fluoroscopic scan, we recommend the 3D navigation, otherwise we use the Fluoro Free navigation.

Disclosure: No significant relationships.

S116 Management of Talar Neck Fractures

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Introduction: Fractures of the neck and body of the talus present difficult treatment challenges. These fractures are often associated with other ankle, foot and skeletal injuries, which complicate the treatment. The vulnerable blood supply and abundant articular surfaces may lead to long term problems. Avascular necrosis of the talus body, leading to severe arthrosis in the ankle joint, is a common complication following talus neck fractures.

Material and Methods: The clinical course of 61 patients with a severe talar neck fracture is presented in this retrospective study. According to the Hawkins classification there were 26 (43%) of Type II, 17 (28%) of Type III and 18 (29%) of Type IV talar neck fractures. The operative treatment was performed in 34 patients (56%) by open reduction and internal fixation, in 13 patients (21%) by external fixation, in 5 patients (7%) with percutaneous screw fixation and in 9 patients (16%) by closed reduction and percutaneous K-wire fixation. External fixation was applied in cases of associated unstable comminuted fractures of the calcaneus or ankle joint and in cases of dislocated open fractures.

Results: The mean of the AOFAS score was 80 points in type II, 74 points in type III and 68 points in type IV fractures. Mild osteoarthritis of the talocrural joint was seen in 14 patients (22%) and severe osteoarthritis in 10 patients (16%).

Conclusion: Closed or open reduction and internal fixation is required in all displaced fractures of the talus. Surgical reduction of talar neck fractures, however, remains a difficult procedure and should be performed under optimal conditions. The postoperative management should consist of early functional treatment and ambulation without weight bearing until the radiographic appearance of trabecular bone in the fracture zone and evidence of revascularization and vitality in the talus body shown by MRI or intraosseous phlebography.

References: 1. Canale, ST, Kelly, FB, Jr.: Fractures of the neck of the talus. Long-term evaluation of seventy-one cases. J of Bone and Joint Surgery [Am] (1978); 60(2): 143-156 2. Hawkins, L.G.: Fractures of the neck of talus. J Bone and Joint Surgery (1970);52 (A): 991-1002 3. Pajenda G, Vecsei V, Reddy B: Treatment of talar neck fractures: Clinical results of 50 Patients. Journal of Foot & Ankle Surgery (2000)1067-2516/00/3906-0365 4. Vécsei, V., Walzer, L., Polterauer,

P.: Central talus fractures, Results of treatment and therapy. *Unfallchirurgie* (1977);3:271-277 5. Weber, B.G.: Brüche von Knöchel und Talus, Bewährtes und Neues in Diagnostik und Therapie. *Langenbecks Arch Chir* (1981);355:421-430 6. Böhler, L: Die Technik der Knochenbruchbehandlung. Band II/2, Wien, Maudrich 1957. 7. Adelaar R, Madrian J: Avascular necrosis of the talus. *Orthop Clin N Am* 35(2004)383-395

Disclosure: No significant relationships.

S117 Talus Fractures: Long Term Results

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Introduction: The major aim of this study was to observe long term results of surgically treated patients with fractures of the talus. Recent studies report a high incidence of complications in Hawkins III and IV types of fractures. The classification of Sneppen and Marti is used less often. The supplementary aim of our study was therefore to assess the predictive value of these two types of classification in terms of functional results. Collected data will also set basis for a comparative study of contemporary patients treated with new minimally invasive methods (arthroscopically and 3D x-ray assisted osteosynthesis).

Material and Methods: In period from January 2003 to December 2007 we have included in a prospective manner all consecutive cases of patients with talus fracture, treated surgically. We have observed baseline characteristics (age, sex, mechanism of injury), fracture type, presence of simultaneous trauma to other body regions (ipsi- and contralateral fractures, polytrauma etc.), time to surgery, type of surgical approach, incidence of complications. In long term follow up (minimum of 24 months, ranging from 24 to 70 M) there were observed x-ray signs of bony healing, development of pseudoarthrosis, arthritis and avascular necrosis. Functional results were assessed using the West point ankle score. All consecutive surgeries caused by the primary trauma were recorded.

Results: In the given time period, we have treated surgically 22 fractures in 22 patients (18 male, 4 female). All fractures were caused by high-energy trauma. Mean age was 30 (16-66). 4 patients were polytraumatized (18%). Ipsilateral extremity was injured in 12 cases, contralateral in 7 cases. Mean time to surgery was 18 h (4-144). These types of fractures were included: 6x Hawkins I type, 4x H II, 2x H III, 2x H IV + Marti IV, 1x M I, 1x S I, 1x S II and 5x M IV + S V. 1 fracture was open (GA IIIa). Less severe fracture types were treated minimally invasive (arthroscopy, x-ray assistance), others using the AL, AM or PL approach. No case of deep wound infection, compartment syndrome or primary loss of reduction was observed. In long term follow up, there have not been seen any cases of pseudoarthrosis, 4 times an avascular necrosis has developed. West point ankle score was higher in less severe types of fractures (80-95 points), whereas the H III, IV and M IV, S V types (+ S I) led to significantly poorer results (30-70 points). WPAS correlated good with assessment of fracture types using Sneppen and Marti classification.

Conclusion: In our group of patients, the baseline characteristics and standard of primary care was comparable to recent papers on this topic. Long term results both in terms of functional score as well as x-ray evaluation correlated with fracture severity (Hawkins classification) and was not influenced by type of surgery (concerning the small study group). Marti and Sneppen classification is valuable in predicting the long term functional results

Disclosure: No significant relationships.

S118 Demographics and Outcome in Metatarsal Fractures

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Introduction: Metatarsal fractures are amongst the most common injuries of the foot, however this is the first study on outcome in metatarsal fractures.

Material and Methods: The initial radiographs of all consecutive patients with metatarsal fractures treated between January 2006 and September 2008 at the Reinier De Graaf Groep in Delft, the Netherlands were re-evaluated. Patient and fracture characteristics were collected. All patients aged 16 to 75 (247 patients) were sent a questionnaire concerning pain, activity and functional limitations, footwear, walking distance, and gait (AOFAS midfoot score). Overall satisfaction of functional status was measured using a Visual Analogue Scale (VAS; range zero to ten).

Results: Four-hundred metatarsal fractures were identified in 322 patients. The distribution of fractured metatarsals was: first metatarsal 5%, second 12%, third 14%, fourth 13%, and fifth 56%. Multiple metatarsal fractures were seen in 15.6%. Most fractures were caused by an inversion injury or fall from height (75%). More than eighty percent of fractures were undisplaced or minimally displaced, and most fracture patterns were transverse or oblique/spiral. A total of 166 patients (67.2%) returned the questionnaire with a median follow-up of 33 months. Responders were female in 56% and had a median age of 47 years (P₂₅-P₇₅ 32-58). In 51.2% of cases the left side was affected. The median AOFAS-score was 100 points (P₂₅-P₇₅ 87-100), the median VAS was 9 points (P₂₅-P₇₅ 8-10). In the univariate analysis the AOFAS and VAS score were inversely dependent of the body mass index ($R_s = -0.409$ and -0.305 ; $p < 0.001$). Patients with known diabetes reported lower VAS ($p = 0.010$) and AOFAS scores ($p = 0.020$). Female patients reported a lower AOFAS ($p = 0.034$). An increase in dislocation (> 2 mm) resulted in a decrease in VAS ($p = 0.017$). No correlations were identified with outcome and which metatarsal was affected, number of fractured metatarsals, fracture type and location, articular involvement, and smoking habits. In the multivariate analysis the BMI correlated with the AOFAS ($p < 0.001$) and VAS ($p = 0.011$) and the dislocation with the VAS ($p = 0.013$).

Conclusion: This is the first investigation using two validated outcome scoring systems to determine functional outcome in metatarsal fractures. Overall outcome in metatarsal fractures is high, as almost all fractures healed without complaints at 33 months. Outcome is dependent of BMI, diabetes, gender, and dislocation at the fracture-site.

Disclosure: No significant relationships.

S119 Percutaneous Stable Fixation of the Fifth Metatarsal Avulsion and the Jones Fracture

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Introduction: Clinical Problem: the avulsion fracture of the MT V bone and the Jones fractures are typical fractures under tension and therefore often require osteosynthesis. Failure and soft tissue problems in fracture healing in nonoperative and tension belt fixation are high. Material and Methods: to avoid soft tissue problems due to the open reduction and implant on the bone surface on the lateral foot a percutaneous technique with a 3,5 mm XXS locked compression nail (S&N) was developed. The fracture is reduced with a K wire witch is also used as guide for the canulated 3,5 mm drill witch prepares the canal for the nail. The locking is performed on both sides of the fracture with one 2 mm threaded wire and the dynamic compression of the fracture is performed with a set screw through the nail. All patients are allowed to walk free with normal foot wear.

Material and Methods: From Jul 1999 to Jan.2006 77 patients were treated according to the above technique, prospectively analysed and re-evaluate at least 6 months after surgery. The evaluation was done with the AO FAS score

Results: The AOFAS of the patients preoperativ was 22 and post-operative 96. No pseudarthrosis or implant failures occurred but in 53 patients (69%) implant removal was performed according to the wish of patients and in part due to local discomfort. The discomfort rate was strictly correlated to the length of the locking wires over the bone surface. 95% of the patients returned to the same activity level. The overall satisfaction of patients was 9 of a scale 1 to 10.

Conclusion: the XXS nail is a new method for minimal invasive and stable fixation of MT V fractures with full weight bearing capacity and shows a low complication rate. However in most cases implant removal was indicated.

References:

Wythe John
Klinische und Radiologische Ergebnisse der Zuggurtung und XS Nagel Osteosynthese der MT V Basisfrakturen.
Promotionsarbeit Univ.Heidelberg 2007

Disclosure: No significant relationships.

BONE HEALING

S120 The Effects of Neutrophils on Differentiation of Mesenchymal Stem Cells

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Introduction: Incidence of fracture non-union is increased after severe trauma. The systemic inflammatory response syndrome (SIRS) resulting from major trauma appears to play a role in this healing impairment. Especially the cellular reaction associated with SIRS influences the inflammatory response, which is of vital importance in fracture healing. We hypothesize that systemic inflammation may

impair healing through an altered interaction between neutrophils and stem- or osteoprogenitor cells within the fracture hematoma. We therefore investigated the effect of neutrophils on differentiation of mesenchymal stem cells (MSCs).

Material and Methods: Osteogenic differentiation of MSCs was assessed using an alkaline phosphatase colorimetric assay on the adhered cell lysate after culturing MSCs for 7 days in the presence of different quantities of neutrophils. Chondrogenic differentiation of MSCs was assessed within the same samples using a glycosaminoglycan colorimetric assay in the cell medium. Proliferation was measured within the same samples using a Picogreen(R) dsDNA fluorescent assay. To assess whether any effect was mediated through release of soluble factors or through direct cell-cell contact, supernatants of stimulated neutrophils were used. Stimulation of neutrophils was achieved during 24 h with TNF-alfa. TNF-alfa in the supernatant was subsequently blocked with Humira prior to interaction with MSCs.

Results: Low neutrophil concentrations resulted in increased alkaline phosphatase concentrations compared to control levels. High concentrations of neutrophils resulted in increased glycosaminoglycan concentrations and decreased alkaline phosphatase concentrations. Addition of low concentrations of supernatant of stimulated neutrophils resulted in increased alkaline phosphatase concentrations compared to control levels. Addition of high concentrations of supernatant resulted in decreased alkaline phosphatase concentrations.

Conclusion: Our results suggest that high neutrophil concentrations stimulate chondrogenic and inhibit osteogenic differentiation. Although stimulation of chondrogenesis by infiltrated inflammatory cells during the initial inflammatory phase of fracture healing may be essential before endochondral ossification can take place, we hypothesize that an increased or prolonged influx of neutrophils during systemic inflammation may impair fracture healing by an overstimulation of chondrogenesis, resulting in hypertrophic callus with insufficient ossification.

Disclosure: No significant relationships.

S121 Cellular Interactions Between Endothelial Progenitor Cells and Osteoblasts. A New Perspective for Engineering of Vascularized Bone Tissue

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Introduction: Angiogenesis is a cue element in the early wound healing and is considered most important for tissue regeneration. In addition to aiding research in understanding the regulatory mechanisms of angiogenesis and vasculogenesis, the concept of co-cultures has helped to better understand the mechanisms of interactions between osteoblasts and endothelial cells focusing on new therapeutic approaches for critical size bone defects. Here, we describe in detail the cellular and molecular interaction between human osteoblasts

(hOB) and human endothelial progenitor cells (EPC) in a complex 3D-environment.

Material and Methods: We investigated endothelial differentiation and morphological organization of human EPC in cocultures with hOB using methylcellulose sphaeroids as well as collagen biomatrices. Cocultures of human umbilical vein endothelial cells (HUVEC)/hOB were used as controls. EPC were tracked with cell tracker red, whereas hOB were transduced using a lentiviral eGFP-vector to allow direct cell visualization using confocal laser microscopy and analysis of cell-specific gene expression. We studied the survival of both cell types and formation of vessel-like sprouts as a criterion of endothelial activity of EPC. Expression of several relevant angiogenic and osteogenic markers, as well as different extracellular matrix proteins was investigated using quantitative RT-PCR.

Results: Using the hybrid coculture technology we could clearly show that hOB regulate the survival, proliferation, and spouting of EPCs. Concordantly, expression of endothelial cell markers CD31 and vWF was significantly up-regulated by cocultivation with hOB. By contrast, EPCs did neither proliferate nor did they form any apparent vessel-like structures when cultured in a monoculture. Using the lentiviral eGFP-reporter transduction method the expression of osteoblast marker genes was also estimated accurately. We could clearly show that EPCs inhibit the terminal differentiation of hOB by interfering with expression of specific transcription factors RUNX2 and SP7. In contrast, cell proliferation and expression of the early osteoblastic differentiation marker ALP were induced in cocultures.

Conclusion: In the present study we demonstrate that human endothelial progenitor cells interact with human osteoblasts on the cellular level. We have identified a complex regulatory mechanism which accounts for endothelial cell survival and cell differentiation of both cell types. This study provides new insight into regulatory mechanisms of bone regeneration and may unveil potential applications in bone tissue engineering and fracture healing.

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S122 Elevated Levels of Parathyroid Hormone in Patients with Traumatic Brain Injury may Enhance Osteogenesis

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Introduction: This study aims at investigating the pattern of parathyroid hormone (PTH) elevation in the serum of patients with a traumatic brain injury (TBI) and its possible role in the pathophysiological mechanisms of enhanced osteogenesis demonstrated in patients with a severe TBI.

Material and Methods: Serum was collected from patients with a long-bone fracture and a TBI (n = 17) or without a brain injury (n = 24) at 6, 24, 72, and 168 h after the injury. The levels of PTH were measured in all samples. The in vitro osteoinductive potential of the sera was determined by measurements of the proliferation rate of

the human fetal osteoblastic cell line hFOB1.19. Additionally, the effects of transient human PTH(1-84) were tested on the proliferation rate of the hFOB1.19 cell line. Cells were incubated with 2.5, 25, and 250 nM PTH(1-84) for 4, 8, and 24 h.

Results: The patients with a TBI had considerably higher mean serum levels of PTH than patients without a TBI (p < 0.05). The sera from TBI patients induced higher proliferation rates of hFOB cells (p < 0.05). PTH(1-84) enhanced the proliferation of hFOB 1.19 cells in a dose dependent manner with the highest proliferation effect after 4 h incubation.

Conclusion: These results suggest that transiently elevated serum concentrations of PTH in patients with a TBI may play a role in the enhanced osteogenesis demonstrated in those patients.

Disclosure: No significant relationships.

S123 BMP-7 Stimulates Early Fracture Healing in Estrogen Deficient Rats

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Introduction: Failure of fixation is more common in osteoporotic than in other fractures. Early treatment of osteoporosis as well as early stimulation of the fracture healing may improve the later clinical outcome. Bisphosphonates are effective in osteoporosis treatment, and bone morphogenetic proteins (BMPs) stimulate fracture healing, although several studies show less effect in estrogen deficient models. In order to determine the effect on early fracture healing of bisphosphonates and BMPs in osteoporotic fractures, these treatment modalities were applied in estrogen deficient rats.

Material and Methods: Forty rats underwent an ovariectomy (OVX), followed by low calcium diet during six weeks. Ten rats underwent a sham operation, followed by normal diet. After six weeks, a closed femoral fracture was induced in all animals. The OVX animals were then assigned to four different groups: OVX alone, injection of bisphosphonate, injection of BMP-7 in the fracture gap, or the combination of these. All animals received a normal diet after the fracture. After sacrifice at two weeks, fracture healing was evaluated using radiographs and four-point bending stiffness and -strength.

Results: Radiographs showed a higher score in the BMP-7 treated animals, with or without the bisphosphonates (p = 0.002, Kruskal-Wallis test). No delay in healing was seen in estrogen deficiency as compared to the sham group. Bending stiffness was higher in the BMP-7 treated groups compared to the others (p = 0.004, Kruskal-Wallis), as was the strength (p = 0.015, Kruskal-Wallis). No significant improvement was found by the injection of bisphosphonates

Conclusion: Early fracture healing is significantly stimulated by injection of BMP-7 in the fracture gap in estrogen deficient rats.

Early treatment with bisphosphonates showed no effect on fracture healing.

References: Bonnarens F, Einhorn TA. 1984. Production of a standard closed fracture in laboratory animal bone. *J Orthop Res* 2: 97-101

Namkung-Matthai H, Appleyard R, Jansen J, et al. 2001. Osteoporosis influences the early period of fracture healing in a rat osteoporotic model. *Bone* 28: 80-86

Amanat N, Brown R, Bilston LE, Little DG. 2005. A single systemic dose of pamidronate improves bone mineral content and accelerates restoration of strength in a rat model of fracture repair. *J Orthop Res* 23: 1029-1034

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S124 Serum From Patients with Traumatic Brain Injury Increases Proliferation and Supports Expression of Osteoblast Markers in Human Primary Skeletal Muscle Cells

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Introduction: Traumatic brain injury (TBI) is associated with an increased rate of heterotopic ossification within skeletal muscle, possibly due to humoral factors. However, the pathophysiological mechanism of heterotopic ossification after TBI is still not fully understood. This study investigated whether cells from skeletal muscle adopt an osteoblastic phenotype in response to serum from patients with TBI.

Material and Methods: Blood was collected from 17 patients with severe TBI as well as ten control subjects. Primary skeletal muscle cell cultures were isolated from orthopedic surgery patients and characterized using immunohistochemical techniques. Proliferation and osteoblastic differentiation were assessed using commercial cell assays, Western blotting (for osterix protein) and the Villanueva bone stain.

Results: All serum-treated cell populations expressed osterix after one week. Cells treated with serum from both study groups in mineralization medium had increased ALP activity and mineralized nodules within the mesenchymal cell subpopulation after three weeks. Serum from patients with TBI induced a significant increase in the rate of proliferation of these cells compared to the controls ($p < 0.05$).

Conclusion: Human serum supports the osteoblastic differentiation of cells derived from human skeletal muscle and, furthermore, serum from patients with severe TBI accelerates their proliferation. This suggests the early presence of humoral factors following TBI that stimulate the expansion of mesenchymal cells and osteoprogenitors within skeletal muscle.

Disclosure: No significant relationships.

S125 Biological Properties of Bone Graft Substitutes: Seeding and Survival of Human Mesenchymal Stem Cells (MSC) and Endothelial Progenitor Cells (EPC)

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Introduction: Bone graft substitutes are increasingly applied in orthopedic surgery, however, the ingrowth of cells and transition to a lasting bone replacement are not clearly known. In this study the seeding efficiency, the time survival and the metabolism of human MSCs and EPCs alone or in co-culture were tested on various clinical available bone graft substitutes in vitro.

Material and Methods: Six commercially available bone graft substitutes were investigated: synthetic beta-Tricalcium phosphate (Chronos®), synthetic beta-Tricalcium phosphate (Vitoss®), synthetic silicate-substituted porous hydroxylapatite (Actifuse®), synthetic alpha-Tricalcium phosphate (Bio-Base®), hydroxylapatite from bovine cancellous bone (Cerabone®) and human processed cancellous bone (Tutoplast®). 250.000 MSCs derived from human bone marrow ($n = 4$), 250.000 EPCs isolated from buffy coat ($n = 4$) and, when cocultured, 125.000 MSCs and 125.000 EPCs ($n = 4$) were seeded onto scaffolds, respectively. On day 2, 6, and 10 adherence of cells (fluorescence microscopy), cellular activity (MTT-assay) and osteogenic gene expression (RT-PCR) were analysed. Sampling of MSC was approved by the local ethics committee.

Results: Regarding MSCs, Tutoplast® showed the highest cell seeding efficiency ($p < 0.05$) followed by Chronos®, Actifuse ABX®, Bio Base® and Vitoss® with Cerabone® showing the lowest values. MSCs seeded onto Tutoplast® demonstrated the strongest metabolic activity and gene expression as well. With regard to EPCs the highest number and metabolic activity of adhering cells was found on Actifuse® and BioBase®, followed by Chronos® and Tutoplast®. Very low cell numbers were found on Vitoss® and Cerabone®. For the combination of MSC and EPC, again Tutoplast® showed the highest number of adhering cells, followed by Chronos®, Actifuse®, Bio-base®, Cerabone® and Vitoss®. These results were confirmed with the results of the MTT-Assay. In this study, positive gene expressions were found for vWF, VEGF, KDR, Col1A, ALP and BGLAP.

Conclusion: Adhesion and function of MSCs and EPCs are clearly influenced by the different scaffolds they were seeded on. In comparison, human processed cancellous bone is the best well structured and biocompatible scaffold for ingrowing MSCs with and without coculture with EPCs in vitro. The differences of cell seeding on commercially available scaffolds seem to be substantial and these differences may be relevant for successful healing of bone defects.

Disclosure: No significant relationships.

S126 Quantitative Assessment of Bone Marrow by Using the RIA (Reamer Irrigator Aspirator) System in a Human Cadaver Study

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Introduction: Large bony defects are still a challenge in trauma and orthopedic surgery. As an alternative to common treatment strate-

gies like iliac crest and bone substitutes, harvested intramedullary bone could be an alternative in clinical practice. A one-step reamer-irrigator-aspirator (RIA) technique has been developed to reduce the intramedullary pressure (IMP) and as a consequence fat embolisation. Reaming procedure leads to the positive side effects of debridement of the intramedullary canal and harvesting intramedullary bone. This study was designed to investigate the quantity of intramedullary bone harvested with the RIA system in eight human cadavers.

Material and Methods: In our study, a total number of 8 human cadavers, 7 males and 1 female, with an average age of 68 years (from 49 to 79) were included. Intramedullary reaming was performed in tibial and femoral bone on both sides of each cadaver. Reamer devices in two different sizes, 12 and 14 were used. After a medial parapatellar incision at both knees, ante grade and retrograde reaming was performed in the tibia and femur.

Results: A significant correlation concerning the quantity of harvested intramedullary bone, $27 \text{ Å} \pm 12 \text{ g}$ in femur and $17 \text{ Å} \pm 9 \text{ g}$ in tibia, was detected in our study group ($p = 0,007$). No significant differences between age, sex, body weight, bone length and BMI could be detected.

Conclusion: Harvesting intramedullary bone with the RIA system is an innovative technique for intramedullary nailing and bone grafting in limb reconstruction and enables spongiosa grafting in one-step procedure.

Disclosure: No significant relationships.

S127 Parameters of Bone-metabolism in a Prospective Analysis After Surgery of Osteoporotic Fractures

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Introduction: The current gold standard to establish the diagnosis of osteoporosis and to follow the pharmacological treatment is the measurement of the bone mineral density (BMD). With a growing number of predicted fractures due to osteoporosis the expenses for BMD-measurement will increase. It was therefore the objective of this study to determine parameters that possibly allow a laboratory follow-up of these patients.

Material and Methods: Since 2008 we operated 166 patients (\varnothing 74.8 y, 84% female) with an osteoporotic fracture (group1). All of them were more than 65 years old and underwent a laboratory screening including the serum levels of Vit-D 25-OH, Vit-D 1.25-OH, calcium (S-Ca), phosphate (S-PhO), P1NP, β -Cross-Laps, intact PTH, osteocalcin, TSH and sex hormones as far as the urine concentration of Calcium (U-Ca) and phosphate (U-PhO). In Vit D 25-OH insufficient patients without treatment a therapy with Alandronat 70 μg once a week and daily calcium and Vitamin D3 substitution was started. 37 patients (\varnothing 68.3y, 54% female) of the orthopedic department underwent the same screening and served as a control (group2). These patients did not sustain a fracture or relevant surgery within at least 6 months. In a second part we checked the evolution of group1-patients laboratory screening at a 3, 6 and 9-months postoperative interval.

Results: Group 1 and 2 displayed significant differences with regard to S-Ca, U-Ca, U-PhO ($p < 0.001$), osteocalcin ($p < 0.02$) and Vit-D 25-OH level ($p < 0.01$). After separating male and female patients significant serum concentration differences of testosterone ($p < 0.02$) in the male patients and of FSH ($p < 0.01$) and oestradiol ($p < 0.001$) in the female patients could be observed. During the follow up at 3, 6 and 9 months we could demonstrate a significant elevation of S-Ca ($p < 0.001$), S-PHO ($p < 0.03$), osteocalcin ($p < 0.03$) and Vit-D 25-OH ($p < 0.04$) concentration. Further we found a significant elevation of FSH- ($p < 0.001$), LH- ($p < 0.02$) and Testosterone ($p < 0.01$) concentration as well as a significant decrease of the oestradiol ($p < 0.001$) concentration.

Conclusion: As former studies showed we confirmed by comparing group 1 and 2 a deficiency of Vit-D 25-OH, S-CA and an elevation of U-Ca in patients with osteoporotic fractures. We could also show a significant difference of the concentration of osteocalcin. By following these blood parameters during treatment we found an improvement or normalization of these differences as a result of the treatment. Therefore we believe that Vit-D 25-OH, S-CA, U-Ca and osteocalcin could serve as follow-up parameters in the treatment of osteoporosis. Further our preliminary results suggest that under the treatment there is a decrease of the testosterone level in male patients and a decrease of the FH- and increase of the oestradiol-concentration in female patients which has not been reported in the literature yet.

Disclosure: No significant relationships.

PROTHESIS SHOULDER

M001 Fracture Arthroplasty of the Shoulder

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Introduction: Fracture arthroplasty remains a valuable technique in the treatment of complex proximal humerus fractures. In order to evaluate the outcome of patients treated by a new prosthetic design and a specific fixation technique of the tuberosities we describe our results in a prospectively documented series of patients.

Material and Methods: All patients treated by hemiarthroplasty using the Affinis fracture- $\hat{\text{A}}$ ® prosthesis between June 2006 and December 07 prospectively have been included in this study. Data recorded at inclusion are: age, gender, operative delay, ASA score and fracture type. The prosthesis used in all these cases is the Affinis- $\hat{\text{A}}$ ® fracture shoulder prosthesis. The tuberosity osteosynthesis includes a circumferential metal cable in all patients. Functional evaluation is performed using the Constant score one year post-operative by an independent student, trained in evaluating shoulder function using the Constant score. Radiographic evaluation consists in evaluation of tuberosity healing (anatomical/non-anatomical) and head centralisation. All data are exported to an excel (Microsoft) spreadsheet and statistically analysis has been performed using Prism5 for Mac OS X software.

Results: Between June 06 and December 07, 50 patients (51 fractures) have been treated for acute fracture using the Affinis fracture

prosthesis. In one patient with an isolated anatomical neck fracture, an excentric head has been used and no tuberosity osteosynthesis was necessary. This patient has been excluded of the study. This leaves us 50 prostheses in 44 female and 5 male patients. The mean age of these 50 patients is 74,2 years of age (range 46-91). Fourteen patients have been lost for clinical follow up. One male patient developed a deep infection, necessitating a 2-stage revision to reversed prosthesis. 6 patients (including the one with bilateral prosthesis) died within the observation period of fracture-unrelated causes. 5 patients were in such poor general condition that further clinical follow-up was impossible. In none of these patients secondary surgery occurred. One psychiatric patient is completely lost for follow-up. Of 8 of these 14 patients we have at least 6 months of radiographic follow-up. This leaves us 36 (4 male, 32 female) patients with both clinical and radiographic follow-up and 44 with 6 months radiographic follow-up. The mean Constant score is 59 points (ranging 31-89). The mean forward range of motion is: elevation 97,6°, abduction 92,1, exorotation 6,4/10 points and endorotation 6,8 points. The tuberosities did heal anatomically in 37/44 patients and in 38/44 patients the head remained centred on the glenoid.

Conclusion: Using this design high rates of union have been achieved. Nevertheless functional outcome remain fair. Of course the advanced age of the patients has an influence on outcome.

Disclosure: S. Nijs has provided consultancy services to Mathys Ltd. Part of this study has been financed using a grant of the Robert Mathys Foundation

M002 Biomechanics of Tuberosity Fixation for Proximal Humeral Fractures Treated with Hemiarthroplasty

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Introduction: Even though the surgeons knowledge, ability and conditions of treating humeral head fractures with arthroplasty improved in the past, many of the problems mentioned 3 decades ago by Neer remain unsolved. It is consensus, that the result of hemiarthroplasty in proximal humeral fractures does not only correlate with anatomic reconstruction of the tuberosities but also with tuberosity healing. Considering this fact not only the proximal aspect of the implants were adopted but also various options of tuberosity fixation were developed. Today sutures, fibre-wire and cable (single and double) fixation are most commonly used.

The aim of our study was to find out if the kind of fixation influences the primary stability of the tuberosities.

Material and Methods: 24 pairs of fresh frozen human humeri were sampled. All soft tissue was dissected instead for the rotator cuff. A four part fracture was simulated by osteotomy. Three groups with 8 pairs each were formed: Group 1: Tornier Aequalis fracture prosthesis [AFT] (suture fixation) vs. Mathys Affinis fracture prosthesis [AFM] (single cable), group 2: AFM vs. Synthes Epoca prosthesis [EFS] (double cable), group 3: AFM cable vs. AFM fibre-wire. All specimen were investigated in a servo-pneumatic testing apparatus.

In 20 consecutive cycles an alternating traction of 40 Newton was exerted on the subscapularis and infraspinatus, while a continuous force was applied for the supraspinatus. The motion of the tuberosities and the shaft were recorded by 2 high-speed cameras. The following parameters were investigated: Failure of osteosynthesis, intertuberosity motion, motion lesser tuberosity-shaft, motion greater tuberosity-shaft, motion metaphysis-shaft.

Results: Group 1: Cable fixation was significantly more stable for intertuberosity motion and tuberosity-shaft motion. Furthermore we found 2 failures for the lesser tuberosity in the suture group. We found no significant difference for the metaphysis-shaft motion. Group 2: The greater tuberosity-shaft motion was significantly lower using two cables. All other parameters showed no significant difference. We found no failures.

Group 3: Since the tuberosity-shaft motion and the intertuberosity motion were significant higher using fibre-wire, this series was abandoned after 6/8 pairs.

Conclusion: Cable fixation is significantly more stable than suture fixation for tuberosities in shoulder arthroplasty. Double-cable fixation does not improve intertuberosity stability. We found tendencies for an enlarged tuberosity-shaft stability. Fibre-wire was no suitable alternative for cable fixation in our set up.

Disclosure: No significant relationships.

M003 Clinical and Radiological Outcome in Low Profile Metaphyseal Shoulder Fracture Prosthesis Design

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Introduction: Healing of the tuberosities in the anatomical position is the most important determinant of outcome after shoulder hemiarthroplasty following proximal humerus fracture (1). Different shoulder prosthesis design are used today to achieve good functional outcome. The purpose of our study was to evaluate the clinical and radiological results with special focus on greater tuberosity after hemiarthroplasty with low profile metaphyseal prosthesis design.

Material and Methods: The study included 35 consecutive patients (mean age 71,5 (range 49-91) years; 11 male, 24 female) with 3- or 4-part proximal humerus fracture treated with hemiarthroplasty. Patients were treated with Aequalis® Fracture Shoulder prosthesis with low profile design and bone graft window which allows bone grafting of the tuberosities. Orthocord® sutures No. 2 were used for tuberosity fixation. Tuberosities were fixed around the prosthesis according to the technique recommended by Boileau, Walch and Krishnan (2). The minimum follow-up period was 6 (6-18) months. 30 patients (85,7%) were available for follow up. Patients were evaluated clinically with Constant-Murley Score (CMS) (3). Greater tuberosity appearance was assessed radiologically.

Results: Mean CMS was 50,4 (23-71). Reconstruction of the proximal humerus was good in 23 (76,7%) cases, acceptable in 5 (16,7%) cases and unacceptable in 2 (0,6%) cases. The greater tuberosity was absent in 6 (20%) cases, atrophy of greater tuberosity was seen in 19 (63,3%) cases and sound greater tuberosity was present in 5 (16,7%) cases. There was no secondary dislocation of tuberosity. After follow

up period 20 (66,7%) prosthesis were in good position, 3 (10%) slightly high and 7 (23,3%) migrated subacromially.

Conclusion: In this study greater tuberosity survival did not correlate with the quality of reconstruction. Greater tuberosity was healed in 80%, but diminished or atrophic greater tuberosity was found in majority of patients. Despite that good subjective and objective results were achieved.

References: 1. Boileau P, Krishnan SG, Tinsi L, et al. Tuberosity malposition and migration: reasons for poor outcome after hemiarthroplasty for displaced fractures of the proximal humerus. *J Shoulder Elbow Surg* 2002;11:401-12.
2. Boileau P, Walch G, Krishnan SG. Tuberosity osteosynthesis and hemiarthroplasty for four part fractures of the proximal humerus. *Tech Shoulder Elbow Surg* 2000;96-109.
3. Constant CR, Gerber C, Emery RJ, et al. A review of the constant score: modifications and guidelines for its use. *J Shoulder Elbow Surg* 2008;17:355-61.

Disclosure: No significant relationships.

M004 Arthroplasty for Avascular Necrosis After Osteosynthesis of the Proximal Humerus

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Introduction: The advent of angular stable implants did enlarge the indications for open reduction and internal fixation of proximal humerus fractures. However avascular necrosis can occur and impede function. In the high demand patient this can be an indication for arthroplasty. We evaluated the outcome of arthroplasty for post-traumatic AVN.

Material and Methods: All patients treated between December 2004 and November 2006 for avascular necrosis of the humeral head after previous osteosynthesis of the proximal humerus were evaluated retrospectively. All files were evaluated for initial fracture type, type of osteosynthesis, time interval between fracture and arthroplasty and pre-op function as scored by range of motion and Constant score. All pre-arthroplasty X-rays were interpreted for extent of the AVN using the Ficat classification system modified by Cruess for the shoulder. Furthermore, all cases are classified according to the Boileau classification for proximal humerus fracture sequelae and the Δ greater tuberosity offset. Post-operative function is scored at the 2 years post-operative follow-up by an independent observer (student trained in the use of the Constant score for functional evaluation of the shoulder). All patients filled out an ASES subjective shoulder score form and were asked for satisfaction with the result. Preoperative and postoperative data were evaluated for statistical differences using the Pearson correlation test and the Kruskal-Wallis test. All analyses were performed on a Microsoft Excel spreadsheet, using Analyse-it software (Analyse-it software ltd)

Results: Between 12-2004 and 12-2006 we treated 11 patients for AVN. 6 of them were male, 5 female. Age ranged from 33 to 72, with a mean of 53.2 years of age. The average interval between initial trauma and arthroplasty was 1.6 years. The preoperative Constant score averaged 31.3 points with a range of 12 to 52. The mean pre-

operative elevation and abduction was 63.6° and 61.3° respectively. The postoperative Constant score averaged 63.2 points, with a range of 40 to 95 points. Postoperatively the patients were able to elevate their arm on average 127.6° and to abduct it 115.4°. Two patients were dissatisfied with the result obtained. There is a strong correlation between the pre- and the postoperative Constant score (Pearson correlation coefficient $r = 0.87$, $p = 0.0005$). There is a non-significant inverse relationship between the interval between initial trauma and definitive treatment and the postoperative Constant score. There appears to be an association with the Boileau classification of fracture sequelae and the final outcome (Kruskal-Wallis test $p = 0.068$).

Conclusion: Not every patient with avascular necrosis of the humeral head after osteosynthesis has poor shoulder function. However, for the more demanding patient with severe collapse and poor function, arthroplasty is the treatment of choice. In all patients a significant increase in shoulder function, as demonstrated by the Constant score, is observed (on average 31.9 points).

Disclosure: S.Nijs has provided consultancy services to Mathys Ltd.

M005 The Use of Reversed Shoulder Arthroplasty in the Treatment of Complex Proximal Humeral Fractures

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Introduction: The treatment of Complex Proximal Humeral Fractures and Fractures associated with Dislocation is not still resolved. Internal Fixation sometimes is not possible due to comminuted and osteoporotic bone which is commonly found in this kind of Fractures. The use of Hemiarthroplasty in this situation, not always achieves a good functional outcome, usually related to a Non Union or Malunion of the Tuberosities. We began using Reversed Shoulder Arthroplasty in this Fractures due to good results this implant had had in Glenohumeral Arthritis associated a Rotator Cuff Deficiency.

Material and Methods: From January 2004 to December 2008 we have treated 50 patients with Complex Proximal Humeral Fractures with a Reversed Shoulder Arthroplasty, 38 were women and 12 were men with a mean age of 76 (38-84). The mean follow-up time was 20 months (10-36). We have used a Lima Reversed Arthroplasty in all the cases. The dominant arm were involved in 65% of the patients. The Deltpectoral approach were used in all the cases. Thirty-five patients (70%) were treated in less than 30 days after the fracture and 15 (30%) were treated 30 days or more since the fracture happened. The operations were performed by 6 surgeons, but only 3 of them have performed more than 10 operations. We used the Constant Score and the American Shoulder and Elbow Score to evaluate the outcome of the implant. The preoperative movement were estimated on the mobility score of the contralateral shoulder.

Results: The mean Constant and the mean modified Constant Score were 55 (23 to 73) and 70 (34 to 95). The average range of motion was 105 (45-140) for anterior elevation and 100 (35-125) for abduction. The mean modified American Shoulder and Elbow Surgeon was 64 (44-82). The average operation time was 105 min with a range (60-170). The main clinical complications has been: Three intraoperative Fractures of Glenoid, 2 post operative Glenoid Fractures, 2 Brachial Plexus Paralysis, 2 cases of Cubital Neuroapraxia, 2 Dislocations of the Prosthesis, 2 superficial infections and 1 deep infection. Radi-

ography it has been found Scapular Notch in 17 patients (34%), Periprosthetic Calcification in 42 (84%) and migration of the Tuberosities in 22 (44%).

Conclusion: We have had better results in acute situations than chronics ones. Most of the complications occurs in the group of patients treated in more than 30 days since the Fracture has happened. The Reverse Shoulder Arthroplasty is an alternative to the Hemiarthroplasty, and an important tool which an Orthopaedic Trauma Surgeon has to consider, to resolve this kind of Fractures specially in elderly patients.

Disclosure: No significant relationships.

M006 Primary Reversed Fracture Arthroplasty in Acute Fractures of the Proximal Humerus

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Introduction: Fracture arthroplasty remains a valid treatment for complex fractures of the proximal humerus in the elderly. However functional results depend on healing of the tuberosities. Advanced prosthetic design and optimized techniques of tuberosity fixation result in increased healing rates, but nevertheless in 1 out of 4 patients anatomical healing of the tuberosities is not achieved. Reversed arthroplasty can be used to treat different pathologies that can be summarised as rotator cuff insufficient shoulders. Some reports on the use of reversed prostheses in the treatment of proximal humerus fractures exist. The most common problem is that reattachment of the tuberosities is difficult and healing is seldom achieved. We describe the use of and outcome of reversed prosthesis specifically designed for the treatment of proximal humerus fractures.

Material and Methods: We prospectively documented the outcome of reversed shoulder arthroplasty for acute fractures using the Affinis Inverse Fracture System (Mathys Ltd, Betlach, Switzerland) and report the 1 year result. Indications for primary reversed arthroplasty were: pre-existing large to massive rotator cuff tear, comminuted tuberosities, female gender and age over 75. Outcome measures are: range of motion, pain, strength, Constant score, complications including notching. Physical examination has been performed by an independent investigator (student trained in evaluating shoulder function using the Constant score). Results have been compared to a historical series of patients treated by hemiarthroplasty.

Results: On average the patients treated by reversed arthroplasty are 7,5 years older than those treated by hemiarthroplasty. The average Constant score in the reversed group is 61,5p whereas 59,5 p in the hemigroup. This difference is statistically not significant. There is a better elevation and abduction in the inversed group. Strength is better in the hemigroup. No other statistical significant differences could be demonstrated. In the reversed group there was 1 infection, 1 fracture of the collar bone and 1 fracture of the coracoid process. In the hemigroup there was 1 infection, 1 periprosthetic fracture, and two loosening of the tuberosities needing revision with a reversed prosthesis.

Conclusion: Reversed arthroplasty results in comparable results as hemiarthroplasty, but in patients being on average 7,5 years older with a similar complication rate as in hemiarthroplasty.

Disclosure: S. Nijs provides consultancy services to Mathys Ltd, the producer of the prosthesis used in this study. Part of the scientific work presented in this work has been funded by the Robert Mathys Foundation.

M007 Specially Designed Inverse Shoulder Prosthesis for Fracture Cases. First Analysis and Results

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Introduction: The results following prosthetic treatment of primary humeral head fractures present great variability. Dissolving of tuberosities leading to dysfunction of the rotator cuff with limited motion, pain and instability are often reported. The short term results on inverse prosthesis on the one hand are promising, whereas scapular notching turns out to be a major problem leading to a high failure rate in the long run. High complication rates are also reported.

Material and Methods: In an ongoing prospective and consecutive multicentre study until today, 199 cases with an inverse shoulder prosthesis system are documented. In this series we analyse the results of the cases treated for primary fracture as indication. In all cases the Affinis[®] Fracture Inverse prosthesis has been used. This implant was specially designed as a reversed treatment option for selected fracture cases. Mechanical and biological notching should be reduced due to the special design features of the prosthesis. Patients were asked to describe pain and satisfaction for the injured shoulder one week before the trauma and also to fill in the ASES Score. The Constant Score for the healthy shoulder was measured whenever possible. Postoperatively Constant and the ASES Score were assessed. The X-rays were evaluated for notching and the healing of the tuberosities.

Results: From February 2008 until today a total of n = 35 cases (29 females and 6 males) were treated for primary fracture with the fracture prosthesis. Mean age at operation was 79.4 years (range 63.4 – 95.5). According to the Neer classification we treated 28 patients with a 4-part fracture, 5 with a 3-part fracture and 2 cases with a head split fracture. After a mean of 9 months (range 1 – 20) the CS reached 55.8 points. Active forward elevation was 114.5° and passive 128.4°. The active lateral elevation (abduction) was 108.0° for the active movement and 112.5° passive. The ASES Score was 68.2 points at the latest follow-up and the value for pain and satisfaction were 1.9 and 7.6 respectively. We found no notching in this series and the tuberosities were judged as anatomically healed in 50% of the cases. We found no difference in the clinical outcome between patients with healed tuberosities compared to the group with non visible tuberosities. Postoperatively two complications occurred one fracture of the clavicle and one fracture of the acromion. So far we did not have any luxations or implant disconnections.

Conclusion: Scapular notching and osteolysis are the main reason for failure in inverse shoulder arthroplasty. To prevent this problem we

designed a novel implant with special design features. So far no scapular notching was detected. Whether this special inverse fracture design prevents or diminishes notching has to be proven with long-term results. The clinical scores of the inversed fracture prosthesis show good short term results

Disclosure: No significant relationships.

M008 Reversed Prosthesis of the Shoulder After Failed Osteosynthesis of Proximal Humeral Fracture

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Introduction: The purpose of this study was to evaluate the results of reversed shoulder prosthesis (Delta 3, De Puy) after a failed osteosynthesis of a proximal humeral fracture.

Material and Methods: 23 Patients after failed osteosynthesis of a proximal humeral fracture were treated with a reversed shoulder prosthesis. 25 fractures were initially treated with a plate, 2 had a proximal humeral nail. The average age was 75 years. Two patients had an infection after osteosynthesis. Follow up was at least 24 months, the patients were followed prospectively using the age and gender correlated Constant score and standardized radiographs.

Results: 19 patients could be completely evaluated. All patients improved from 20% to 69% in Constant Scores during follow up. Three patients needed revision for postoperative instability within 8 days after the procedure. There were two hematoma and a partial temporary lesion of the N. axillaris after the prosthesis. All patients were satisfied with the result and would choose this surgery again. Active abduction improved from 46° to 92°. There was no evidence of loosening in any of radiographic follow up, 10 shoulders showed no inferior notching according to Nérot.

Conclusion: Reversed shoulder prosthesis after failed osteosynthesis of proximal humeral fractures is an effective method to improve function and pain in this difficult group of patients, but results are inferior compared to those when this device is used for different indications.

Disclosure: No significant relationships.

SPLEEN

M009 Value of Spleen Imaging with Tc99m Labeled Heat-Damaged Erythrocytes in Evaluating the Function of Autologous Splenic Transplantation

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Introduction: The purpose of this study is to evaluate the survival and function of splenic autotransplants using spleen imaging with Tc^{99m} labeled heat-damaged erythrocytes.

Material and Methods: 40 patients with splenic rupture underwent spleen imaging with Tc^{99m} labeled heat-damaged erythrocytes at 1 to 2 months after splenic autotransplantation (early scans); also, 15 of them underwent the same imaging technique at 3 to 6 months after operation (follow-up scans).

Results: On early scans, splenic autotransplants were faintly and the intensity of radioactivity in autotransplants was lower than in liver. The increase of intensity of tracer accumulation in autotransplants was significant higher on follow-up scans. One week after operation the levels of CD₄, CD₈ and CD₄/CD₈ ratio were significantly lower than those of controls and returned to normal 3 months later.

Conclusion: The spleen imaging with Tc^{99m} labeled heat-damaged erythrocytes is a valuable and effective method for evaluation of the survival and function of splenic autotransplants.

References: 1. Miko I, Brath E, Nemeth N, Furka A, Sipka S Jr, Peto K, Serfozo J, Kovacs J, Imre S, Benko I, Galuska L, Sipka S, Acs G, Furka I. Spleen autotransplantation. Morphological and functional follow-up after spleen autotransplantation in mice: a research summary. *Microsurgery*. 2007;27(4):312-6. Review. 2. Nunes SI, Rezende AB, Teixeira FM, Ferreira AP, Alves MM, Jamel N, Assis RV, Teixeira HC. Antibody response of autogenous splenic tissue implanted in the abdominal cavity of mice. *World J Surg*. 2005 Dec;29(12):1623-9.

Disclosure: No significant relationships.

M010 Splenic Injuries Resulting From Ski Accidents

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Introduction: Severe blunt abdominal trauma results from ski accidents. The aim of this study was to record splenic trauma cases after ski accidents (ski, mountain ski and snowboard) admitted to General and Emergency surgery department of Grenoble University Hospital

Material and Methods: From 1 January 2004 to 31 March 2008 29 patients (25 men, 4 women) with splenic injuries were observed, 17 (59%) after ski and 12 (41%) after snowboard practice. Mean age was 24.2 years (15-45 YO), mean age for men was 22.9 years, for women was 32.5 years (p = 0.005). 11 patients were directly admitted to our hospital, 18 patients were transferred. 13 patients had isolated splenic trauma (45%), 16 were victims of polytrauma (55%), respectively 20/17 in the group "skiers" (59%) and 6/12 in the group "snowboarders" (50%). The AAST grade of injury was: AAST 1 1 case; AAST 2 11 cases; AAST 3 10 cases; AAST 4 6 cases; AAST 5 1 case. 3 of the 19 "skiers" (17%) and 6 of the 12 "snowboarders" (50%) showed a high grade (AAST > 3) splenic injury. 8 patients have an Injury severity score > 15 (4/19 skiers and 4/12 snowboarders); 2 cases of severe brain injury, 2 case of associated liver injuries, 3 cases of associated left renal injuries. 1 patient had associated colonic and pancreatic injury.

Four patients were not stable at admission and had immediate laparotomy with 3 splenectomies. 25 patients were elected for non-operative management.

Results: 6 splenectomies was performed with a splenic salvage rate of 79%. There was no mortality and morbidity was 15%. For the three patients who had immediate splenectomy the recovery was uneventful. In the group nonoperative management three patients had angioembolization and four had delayed laparotomy (3 for delayed splenic rupture at post injury 4,5 and 9 resectively; 1 for SIRS). In the 26 patients with available data, mean hospital stay was 10 days (3-88), 7.7 days (3-88) for the group skiers and 12-25 days (5-47) for the group snowboarders.

14 patients (54%) were recovered less than 10 days. 16 patients were admitted initially in ICU ward (from 1 h to 46 days).

Conclusion: Ski accidents are in cause for more the one-third of all splenic injuries admitted to Grenoble University Hospital. The mean age is lower and male incidence is higher than splenic injuries admitted for other causes (road traffic accident, falls, other mountain accidents). An high number of snowboarder's accidents was observed and pattern of injury is poor in these patients. The incident of polytrauma cases was the same in two groups and this observation confirm that snowboard practice is at higher risk than skiing for severe splenic injuries. In France, if number of road traffic accidents is decreasing, the number of sport accidents is increasing in the last years. A better comprehension of mechanism, epidemiology and histological findings of splenic injuries resulting from skiing and snowboarding is necessary to improve trauma prevention programs.

Disclosure: No significant relationships.

M011 Non-operative Management of Blunt Injury to the Spleen in the Multiply Injured Patient

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Introduction: Management of splenic injuries has evolved over the past three decades. Prior to that time, a diagnostic peritoneal lavage positive for blood was an indication for exploratory laparotomy because of the concern about ongoing hemorrhage and/or missed intra-abdominal injuries. In children the nonoperative management (NOM) of splenic injuries rapidly gained interest because of the significant incidence of post-splenectomy sepsis as well as the complications associated with non-therapeutic laparotomies. The last decade has witnessed a proliferation of reports of NOM in adults with injuries to the spleen. Inclusion criteria for NOM in adults, which have been a source of controversy, continue to evolve. Moreover we noted that most publications focused on isolated splenic injury and not on patients with multiple injuries. This study was conducted to summarize the indications for the NOM of blunt splenic injury with special attention to the multiply injured patient.

Material and Methods: We conducted a medline search. The search was designed to identify English language citations between 1974 and 2009; using the keywords: blunt splenic injury, conservative management, multiply injured patients and blunt abdominal trauma. The bibliographies of the selected references were examined to identify relevant articles not identified by computerised search. One hundred articles were identified. A cohort of three trauma surgeons selected 50 articles for review and analysis.

Results: We used the methodology developed by the agency for Health Care Policy and research of the United States Department of Health and Human Services to group the references into three classes. Reviewing all data showed that the NOM of blunt splenic injury is a safe treatment modality in isolated cases but also the multiply injured patient.

Conclusion: Currently the non-operative management of blunt injury to the spleen is the treatment modality of choice. Important is a haemodynamically stable patient, with no signs of peritonitis on physical examination. Patients who only maintain their blood pressure by the constant infusion of crystalloid or blood products are not haemodynamically stable and need surgical intervention. CT scan findings and grade of injury are not, in themselves, criteria for laparotomy. These criteria are applied to isolated injuries to the spleen but can also be applied to the multiply injured patient. Age itself is not a contraindication. The general condition of an individual patient needs to be decisive, and finally hospitals with a low trauma incidence can safely use these guidelines in their management protocol.

Disclosure: No significant relationships.

M012 Quality Assessment of Non Operative Management and Short Term Outcomes in Splenic Trauma: Analysis of 2679 Patients in 8 years From the Regional ICD-9CM Administrative Database

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Introduction: Non Operative Management (NOM) is the gold standard in hemodynamically stable patients with splenic trauma but uncertainty exists about safety and efficacy. The study aim was to assess the quality of splenic trauma management from a large population database of the 7th most populated Italian region (Emilia-Romagna, 4,293,825 inhabitants) analyzing the data from Hospital Discharge administrative forms (HDF) and ICD-9CM codes in the period 2000-07.

Material and Methods: The selection criteria for identifying splenic trauma patients was the presence of the codes 865.0X and 865.1X. NOM rate resulted from the HDF having splenic trauma codes and without splenectomy (41.5). NOM failure was estimated when splenectomy was performed on a later date than admission. We sorted 2679 patients from all regional hospitals (ER) and 273 from Bologna Trauma Center (TC).

Results: NOM could have been underestimated because of missing codes of the low spleen injury grades in HDF. NOM rates increased significantly from 52.4% in 2001 up to 59.3% in 2007 in the whole

region, compared to even more marked increase in TC in the same years (from 41.4% to 61.3%, Test Trend $p < 0.001$). Average NOM failure rates were 26.3% in ER and 27.2% in TC ($p = ns$) with a significant decrease over the period in both settings. Overall in-hospital mortality was significantly higher in TC (12.8% vs 8.5%, $p < 0.05$) with a significant trend towards reduction over the period in both settings. Length of hospital stay (LOS) in ER was longer in splenectomy (16.8 vs 13.8 days, $p < 0.001$), whilst no differences have been observed between NOM and splenectomy in TC. Mortality of successful NOM patients was significantly lower than splenectomised (5.6% vs 10.5% in ER and 6.5% vs 16.9% in TC, $p < 0.001$) with a significant decrease of about half in both groups of NOM and splenectomy in TC. In the subgroups of isolated splenic injury in TC NOM has been used more widely (58.6% vs 52% of ER, $p < 0.001$) with higher failure rates (29.4% vs 26%, $p = ns$). Hospital stay did not differ significantly between successful NOM and splenectomy groups as well as ER and TC, except in the group of successful NOM in TC, associated with a significantly longer hospital stay. Overall in-hospital mortality was higher in TC (10.3% vs 1.65%, $p < 0.001$), being 0% in the case of successful NOM in both settings vs 2.7% in splenectomy group (ER) and 17.6% (TC).

Conclusion: Administrative databases using ICD9-CM codes are cost-effective in quality assessment of Trauma care. NOM in splenic injuries is spreading and failure rate is decreasing. NOM can be safely performed in rural settings and seems to be associated with better outcome and lower in-hospital mortality, without significant differences in the overall LOS.

References: Fortuna D. et al. *Interact Cardiovasc Thorac Surg.* 2006 Apr;5(2):123-7

Disclosure: No significant relationships.

M013 Outcome of Emergency Embolization in the Non-operative Treatment of Blunt Trauma of the Spleen: Multicenter Retrospective Study of 52 Cases

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Introduction: Splenic artery embolization (SAE) was developed as a non-operative treatment of injuries of the spleen, but its results and risks are still poorly evaluated in France.

Material and Methods: From 1/3/2000 to 30/6/2008, 52 patients with (44 M, 8F) with a mean age of 31.1 years + /-14 years [41patients ≤ 45 years (78%)] received an SAE, within 1-4 h after their arrival in the Reference Hospital for 26 patients, 12-24 h for 6 patients, and 36-372 h for 20 patients the traffic accidents were the cause of splenic trauma in 22 cases (42%), mountain trauma in 10 cases (19%), bike and motorcycle accident in 6 cases (11%) a domestic accident in 5 cases, suicide attempt in 2 cases and other causes in 7 patients. On arrival 43 patients were hemodynamically stable, 9 (17%) showed signs of shock with a TAS ≤ 9 and/or heart rate ≥ 110 b/min). Splenic traumatism was classified according to the classification of the AAST (EE Moore et al., *J Trauma* 1995): Stage II (7 cases), stage

III (21 cases) stage IV (22 cases), stage V: 1 (missing data: 1 case). The main indications for splenic artery embolization were: extravasation of contrast medium on CT scan (25 cases); progressive need for transfusion (6 cases); early pseudo-aneurysm (10 cases) and arterio-venous fistulas (2 cases) or both (1 case). The preventive SE was realised for major traumas Moore IV (5 cases).

Results: There was no mortality and the morbidity was 25% (13/52). The complications of SAE are summarized in the table below. * Abdominal pain 1 case * Pleural effusion 5 cases * Persisting bleeding 1 case * Fever 3 cases * Splenic pseudo cystic 2 cases * Arterio-venous fistula 1 case Two patients who initially underwent SAE ultimately required splenectomies for persistent bleeding. The overall splenic salvage rate was 96%. There was no correlation between the time of the SAE, morbidity and secondary splenectomy **Conclusion:** The results of splenic artery embolization are good with overall salvage rate of 96% and a morbidity of 25%. Our results are comparable to those of the literature (Haan et al., *J Trauma* 2004) For selected patients, embolization can reduce the rate of splenectomy for trauma.

Disclosure: No significant relationships.

M014 Does Our Golden Hour Also Apply to Patients Receiving Embolization in Splenic Injuries?

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Introduction: The treatment of trauma patients with solid organ injury has changed over the last 15 years towards a less invasive treatment. Still our algorithms especially in dealing with trauma patients with ongoing internal abdominal haemorrhages is still based on fast control on stopping of the bleeding by any means. The use of CT-abdomen and subsequent performing angiography and embolization takes time. We analyzed the time path involved in angiographic control of the bleeding spleen.

Material and Methods: A retrospective study. The study group consisted of ten patients presenting at our institution with a traumatic spleen injury in the period November 2006 till November 2008. All patients were managed according to the principles of ATLS. Data were analyzed using SPSS® 16.0.

Results: The study group consisted of seven men and three women. Average age was 25 years (range 15 till 39). The ISS was on average 26 (range 20 – 40). All patients in the study group received an angiography after CT-abdomen which showed an active bleeding focus in the spleen. Organ injury score were eight grade 4 and two grade 3 spleen injuries. Average time from admission to angiography was 139 min. Time to control of bleeding by embolization took average 50 min. Time loss between CT and angiography was on average 88 min.

Conclusion: The time paths involved in managing this group of trauma patients with spleen injuries by embolization are much longer than expected. The time involved after diagnoses to actual control of the bleeding spleen injury is much longer than anticipated. Logistic changes to limit the time loss in interpretation of data from the CT-A, transfer of the patient, preparation of the angio-suite and less time consuming technique to actual embolization are needed.

Disclosure: No significant relationships.

M015 The Failure Rate of Non-operative Management in Children with Splenic or Liver Injury with Contrast Blush CT. A Systematic Review

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Introduction: Purpose: Nonoperative management (NOM) is the choice of treatment for hemodynamically stable pediatric patients with spleen or liver trauma. The aim of this study was to assess the failure rate of NOM in children with blunt liver and/or splenic injury when a contrast blush is present on a CT scan.

Material and Methods: Methods: A systematic review of the literature published between 1985 and 2009 was performed by searching the EMBASE and MEDLINE database for English and German articles. Articles were eligible if they reported the failure rate of NOM with or without angio-embolization (AE) in pediatric patients with splenic and/or liver injuries with a contrast blush on CT and included two or more trauma patients. Two reviewers independently assessed the eligibility and the quality of the articles and performed the data extraction. Interrater differences were resolved by discussion.

Results: Nine studies were included describing 117 pediatric patients. The median sample size was five (range 2-44). Seven studies (including 71 patients) reported a total of 16 patients with failure after NOM without AE. Failure rates across these studies ranged from 4.5 to 100%; the pooled percentage was 28.2% (95% CI: 8.9%-61.3%). The failure percentages after NOM with or without AE ranged from 0 to 100%; the pooled percentage was 21% (95% CI: 7.5%-46.8%). Two studies (including 46 patients) reported a total of 3 patients with failure after NOM with primary AE: a percentage of 6.5%.

Conclusion: Despite the current low level of evidence on failure rate of NOM when a contrast blush is present on CT we emphasize that there is a significant amount of patients in whom NOM fails. We therefore recommend that the management of splenic and hepatic injury in children should not only be based on the physiological response but also when a contrast blush is present on CT.

Disclosure: No significant relationships.

M016 Advanced Age Increases the Failure Rate of Non-operative Management of Blunt Splenic Injuries

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Introduction: Non-operative management (NOM) of blunt splenic injuries in hemodynamically stable patients is nowadays considered the standard treatment.

Material and Methods: The aim was to clarify the criteria used for primary operative management (OM) and planned NOM. Furthermore, the study aimed to identify risk factors for failure of NOM. All adult patients with blunt splenic injuries treated from 2000-2008 were reviewed and a logistic regression analysis employed.

Results: There were 206 patients (146 men, 70.9%). Mean age was 38.2 ± 19.1 years. The mean Injury Severity Score (ISS) was 30.9 ± 11.6 . The American Association for the Surgery of Trauma (AAST) classification of the splenic injury was: grade I, n = 43 (20.9%); grade II, n = 52 (25.2%); grade III, n = 60 (29.1%), grade IV, n = 42 (20.4%) and grade V, n = 9 (4.4%). 47 patients (22.8%) required immediate surgery (OM). More than 5 units of red cell transfusions (odds ratio [OR] 13.72, $P < 0.001$), a Glasgow Coma Scale < 11 (OR 9.88, $P = 0.009$) and age ≥ 55 years (OR 3.29, $P = 0.038$) were associated with primary OM. 159 patients (77.2%) qualified for a non-surgical approach (NOM), which was successful in 89.9% (143/159). The overall splenic salvage rate amounted to 69.4% (143/206). Multiple logistic regression analysis found age ≥ 40 years to be the only factor significantly and independently related to the failure of NOM (OR 13.58, $P = 0.001$).

Conclusion: Advanced age is associated with an increased failure rate of NOM in patients with blunt splenic injuries.

References: Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR. Organ injury scale: spleen and liver (1994 revision). *J Trauma* 1995;38:323-324.

Disclosure: No significant relationships.

DISASTER & MILITARY SURGERY

M017 Aggressive Management of Battle Casualties

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Introduction: Warfare is the leading cause of trauma death in the world. This problem get compounded in the battle casualties because of shear magnitude and extent of damage. This paper outlining the development of surgery in the form of aggressive surgical approach combined with high tech surgery and better understanding of biology of war wound to minimize the morbidity and mortality in the present era.

Material and Methods: 523 battle casualties were treated in army hospital providing tertiary care. All patients were male serving soldiers. Out of 523 casualties 205 patients were having injuries in the form of open fractures following gunshot, splinter injuries or missile injuries. Open fractures were subjected to aggressive management like repeat wound debridement, primary internal fixation and soft tissue cover. External fixation was used in those cases where immediate internal fixation was not possible.

Results: Out of 523 patients 274 patients had fracture involving extremity, 6 patients had spine injury with paraplegia and 15 patients had nerve injuries either sciatic, radial ulnar or both. In lower limb out of 3 acetabulum fracture. 2 fractures were fixed with reconstruction plate. In fracture neck femur cannulated screw fixation was done. Trochanteric fracture fixed with dynamic hip screw. In fracture shaft femur series interlocking nail with primary bone grafting was done. In severely infected only external fixation with wound debridement was done. In case of open fracture of tibia interlocking

nail fixation 6 cases, 5 cases external fixation with pinless fixator followed by intermedullary undreamed nailing after infection control and 4 cases dynamic compression plating was done. Malleolar, Tarsal and metatarsal fractures were fixed with either screw fixation and "K" wire fixation. In upper limb injury interlocking of humerus, shaft fracture and plating was done in forearm fracture.

Conclusion: Based on this study conclusion was immediate primary closure of open wound after thorough debridement by experienced war surgeon appears to cause no significant increase in infection or delayed and non union. Rather early closure decrease the requirement of repeated debridement and minimise the morbidity and mortality of soldiers and uplifting the morale of troops fighting war.

References: Coupland RM, War wounds of the limbs: Surgical management Butterworth Heineman, Oxford (1993). Davis GL. Management of open wounds of joints during Vietnam War: A preliminary study, Clin Orthop. 1970;68:3-9. Feltis, JM: surgical experience in a combat zone (1970). American journal of surgery. 275-278, 1970.

Disclosure: No significant relationships.

M018 Blast Injuries of Large Tyres: A Case Series

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Introduction: Severe blast injuries of large tyres are similar to those resulting from landmines explosions with neither thermal nor chemical effects. Little has been written about the destructive nature of these blasts

Material and Methods: All patients who had tyre blast injuries and were admitted to Al Ain or Tawam Hospitals between March 2003 and September 2009 were retrospectively studied. Clinical presentation, management, hospital stay, and outcome were reviewed

Results: Seven male patients were studied. They had a median (range) age of 38 (20-53) years. Four patients (57%) were inflating the tyre when it suddenly exploded. On arrival to the hospital, two patients were shocked with GCS of 3/15. Six patients (86%) had head and face trauma. Three patients had multiple injuries to different body parts (43%). The median (range) injury severity score was 14 (10-33). Four patients (57%) were operated on. Five patients were admitted to ICU with a median (range) hospital stay of 2 (1-2) days. The median (range) total hospital stay was 3 (1-14) days. Two patients died (overall mortality 29%).

Conclusion: The high energy produced by large tyre blasts leads to severe injuries of the victims leading to high mortality and morbidity. Preventive occupational methods should be adopted and implemented at the work place

References:

1. Rautji R, Rudra A, Dogra TD. An unusual fatal injury due to tyre burst: a case report. Forensic Sci Int 2003; 138: 111-113. 2. Obafunwa JO, Busuttill A, Scott C. Fatal compressional injuries from a burst

tyre: an industrial death. J Clin Forensic Med 1997; 4:176-180. 3. Sussman AM, Williams JS, Boyd CR, DeLoach ED. Multipiece tire rim injuries. J Trauma 1991; 31:24-27.

Disclosure: No significant relationships.

M019 Terrorist Bombing: Surgical Management of Blast Effects

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Introduction: The two major goals of terrorism are the maximizing of casualty generation and maximising the lethality of those casualties. Explosive blasts become the most common and destructive terrorist weapons around the world because of the small amount of money and training they require. Cause of the new nature of terrorism act, surgeon need to be prepared for mass casualties by terrorism bombing

Material and Methods: We report the experience of the French level 2 surgical unit in Afghanistan from January to April 2007.

Results: Primary blast injury: this form of injury results from the deleterious effects of the blast wave passing through the body. These waves have little or no effect on solid organs but have their major destructive potential in air containing organs, especially lungs. Secondary blast injury refers to the impact on a patient's body of projectiles usually inert. The addition of destructive metal fragment, nails and other such objects to bombs increase the severity of injury and lethality. Tertiary blast injury refers to the deceleration and impact with the ground, wall or other inanimate object of the patient whose body is displaced by the blast. Quaternary blast injury refers to the miscellaneous forms of injury by-products of explosions, burns, inhalation of dust, contamination in case of "dirty bombs" or penetration of allogenic body parts shrapnel. This last one asks the question of contamination by hepatitis or HIV and modalities of surveillance and treatment.

Conclusion: Blast injuries are complex and require the expertise of surgeons for their evaluation, treatment and longterm recovery. The victims of this form of terrorism sustain unusually severe and complex multidimensional forms of trauma not typically encountered in routine surgical practice. Surgeons must be leaders and active participants in disaster planning and management; they are uniquely qualified to manage the physical trauma that results from most forms of mass casualty events, including blasts.

Disclosure: No significant relationships.

M020 Management of Explosions and Blast Injuries After the Gerdec Tragedy (Albanian Experience)

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Introduction: As the risk of terrorist attacks increases in the world, disaster response personnel must understand the unique pathophysiology of injuries associated with explosions and must be prepared to assess and treat the people injured by them. The explosions at the army depot in Gerdec village, some 10 km north of Tirana, were heard more

than 50 km (30 miles) away. Albanian newspapers described the blast as “Albania’s Hiroshima” and an “Apocalyptic tragedy”.

Material and Methods: Efforts to dismantle Albania’s stockpiles of obsolete munitions took a catastrophic turn on March 15th, when a series of explosions occurred as crews were clearing out a storage depot in Gerdec, near Tirana. The explosions lasted nearly 14 h, resulted in 26 deaths, over 300 injuries, thousands of homeless and 16.6 m euros worth of damage and catastrophic damage to hundreds of homes and other civilian structures within a 2.5 km (1 1/2 miles) radius. Seven other defense ministry officials and managers of the private company disposing of the ammunition have been arrested on charges of negligence. About 100,000 tons of excess ammunition, mostly Russian and Chinese artillery shells made in the 1960 s or earlier, are stored in former army depots across Albania.

Results: The distribution of traumas by sex are as following. Female 89 cases or 51% and male 87 cases or 49%, The distribution of traumas based on the age are as following till 14 years old 27 cases or 15%, from 14 to 30 years old 44 cases or 25% over 30 years old 105 or 60%. The patient with VLC was 99 cases or 56%, with different fractures was 11,3% or 20 cases, with Comotio & contusio corporis was 43 cases or 24%, with different stage combustio was 13 cases or 7%. 66 cases or 37% was hospitalized for continuance of treatment, and 11 cases or 16% was transferred abroad.

Conclusion: Explosive and blast injuries represents a true modern epidemic that threatens the very survival of the free world. A thorough understanding of detonation and blast dynamics by the treating teams is required to better correlate the injury patterns presented. This is also critical for revision of current multiple casualty protocols. It is up to the medical establishment to prepare suitable protocols, coordinate manpower and secure medical resources to successfully handle events.

References: Arnold JL, Halpern P, Tsai MC, Smithline H. Mass casualty terrorist bombings: a comparison of outcomes by bombing type. *Ann Emerg Med.* Feb 2004;43(2):263-73. Almog G, Luria T, Richter E, Pizov R, Bdoiah-Abram T, Mintz Y. Can external signs of trauma guide management?: Lessons learned from suicide bombing attacks in Israel. *Arch Surg.* Apr 2005;140(4):390-3. Almog G, Rivkind AI. Surgical lessons learned from suicide bombing attacks. *J Am Coll Surg.* Feb 2006;202(2):313-9.

Disclosure: No significant relationships.

M021 Severe Secondary Blast Injuries: Contemporary Surgical Approaches

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Introduction: Treatment of secondary blast injuries is a challenge for the surgeons despite of the contemporary resources of medicine, because of the multidimensional effects of the blast.

Material and Methods: Five clinical cases of bulgarian soldiers with severe secondary blast injuries during their missions in Afghanistan are presented. All of them have had multiple (more than 10) fragment

wounds with different morphology, size and penetration, and in one case there was a grave transitory fragment injury of the pelvis that affected the rectum.

Results: Average Injury Severity Score (ISS) was 19,4 (vary from 12 to 29). All the wounds have been evaluated and classified according to the Red Cross Wound Score. For the treatment of patients we have used contemporary surgical approaches in the following order: Damage control surgery (DCS) and medical evacuation, Inter pulse jet irrigation for wound debridement, VAC PACK dressing with negative pressure and Versa jet for necrectomies. This sequence of therapeutic options was used for the first time in Bulgaria. During the quantitative analysis of wound contamination it came out that the use of pointed surgical devices for debridement decrease with 70% the degree of wound contamination. The utilization of VAC PACK dressings’ results in 50% acceleration of wound granulation and healing compared with the conventional dressings. Due to the used methods the survival in the presented series is 100%, although all patients have been with hypothermia, hypo coagulation, acidosis and excessive hemorrhage.

Conclusion: The presented cases well demonstrated the complexity of blast trauma. The initial treatment must follow the principles of DCS, but final stages of the treatment should be made by multidisciplinary team capable to apply the contemporary achievements of surgery and reconstructive medicine.

References: 1. Mayo, A., Kluger, Y. (2006). Terrorist bombing. *World Journal of Surgery* 13, 1–33. 2. Johnson JW, Gracias VH, Schwab CW, et al. Evolution in damage control for exsanguinating penetrating abdominal injury. *J Trauma.* 2001;51(2):261–271. 3. Granick MS, Tenenhaus M, Knox KR, Ulm JP Comparison of wound irrigation and tangential hydrodissection in bacterial clearance of contaminated wounds: results of a randomized, controlled clinical study. *Ostomy Wound Manage.* 2007 Apr;53(4):64-6, 68-70, 72. 4. Gregor S, M Maegele, S Sauerland, JF Krahn, Negative Pressure Wound Therapy. A Vacuum of Evidence? *ARCH SURG* 2008; VOL 143 (NO. 2), pp 189-196. 5. Gabriel A, Shores J, Heinrich C, Baqai W, Kalina S, Sogioka N, Gupta S. Negative pressure wound therapy with instillation: a pilot study describing a new method for treating infected wounds. *Int Wound J.* 2008 Jun;5(3):399-413. 6. Granick MS et al., “Efficacy and cost-effectiveness of a high-powered parallel waterjet for wound debridement”, *Wound Repair & Regeneration*, 2006, 14, 394-397

Disclosure: No significant relationships.

M022 Craniofacial Trauma: Further Damage or Protection of Brain Parenchyma? A Prospective Study

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Introduction: During the last decades there is a debate concerning the fact if the facial fracture can cause further damage or somehow to protect the brain parenchyma from a more severe injury. The aim of our study is to analyze the effects of facial trauma exerted upon brain parenchyma.

Material and Methods: A series of 500 patients with craniofacial fractures was studied. The injuries were separated into five grades of severity based on neurological examination including cranial CT. The injuries were also grouped into three categories based on facial regional involvement CT –facial reconstruction

Results: The Control group included 383 patients with head trauma but without any facial fracture or brain injury. In group A included 82 (16,4%) patients with both facial fracture and brain damage. Among them 30 diagnosed with temporal-mandibular fractures accounting for 36,5%, 6 patients (7,31%) had lower mandibular fracture, 34 patients (41,4%) diagnosed with nasal fractures and 12 patients (14,6%) had orbital fractures. In group B were categorized 35 patients with only brain damage accounting for 7%.

Conclusion: The data demonstrated that patients with upper facial fractures were at greatest risk for serious closed head injury (CHI). Injuries to both the mandibular and the midfacial regions with no upper facial involvement more frequently resulted in mild CHI with a modest likelihood of no neurological deficits. Trauma to only the mandibular region or to only the midfacial region was least likely to involve CHI

Disclosure: No significant relationships.

M023 Posttraumatic Stress Disorder in Hospitalized Terrorist Bombing Attack Victims

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Introduction: Post-traumatic stress disorder (PTSD) is a psychiatric disorder that results from exposure to a traumatic event. The individual may develop symptoms of three distinctive types: intrusive and unwanted recollections, avoidance followed by emotional withdrawal, and heightened physiological arousal. People who are exposed to traumatic events may also have somatic symptoms and physical illnesses, particularly hypertension, asthma and chronic pain syndromes. Hospitalized victims of suicide terror attacks are unique due to the circumstances and severity of their injuries which could have possibly affected the occurrence of PTSD and delayed the recognition of PTSD development. Our objectives were to evaluate the prevalence and severity of PTSD among hospitalized victims of suicide bombing attacks and to assess variables of physical injury as risk factors for the development of PTSD.

Material and Methods: Forty-six hospitalized victims of suicide bombing attacks were evaluated for PTSD using the PSS-sr questionnaire by phone. Demographic and medical data considering the severity of injury, type of injury and medical treatment were collected from the medical files. Injury Severity Scale (ISS) was used to assess severity of physical injury.

Results: The prevalence of PTSD among hospitalized victims of suicide bombing attacks was 52.2%. Presence of blast lung injury was significantly higher in the PTSD group compared with the non-PTSD group (37.5% vs. 9.1% respectively, $p < 0.04$). There was no significant difference in ISS values between PTSD and non-PTSD groups. Blast lung injury and intracranial injury were found to be predictors of PTSD (odds ratio 125 and 25, respectively). No correlation was

found between length of hospital stay, length of ICU stay or severity of physical injuries to the severity of PTSD.

Conclusion: Hospitalized victims of suicide bombing attacks are considerably vulnerable to develop PTSD. They should be evaluated with a high level of suspicion in order to identify PTSD symptoms and treated as soon as possible in conjunction with physical treatment. Blast lung injury and intra cranial injury are predictors of PTSD. Victims suffering from these conditions should be monitored closely and treated in conjunction with their physical treatment.

Disclosure: No significant relationships.

M024 SMART: a New Triage for Disasters and Emergency: Methods to Comparison

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Introduction: In the disasters the triage it is a fundamental tool for the categorization of the victims in codes of gravity. The SMART (Simple Method for a Rapid and Advances Triage) is a method of new triage, servant and spread by the Italian group PME (Maxi Emergency Plan). It was born from the demand of assist rapidity and simplicity of employment with the practical reliability of an advanced triage, performed by sanitary formats on the concepts of the Medicine of the catastrophes. They consider the traumatic pathologies, medical, the serious anatomical and functional lesions that can present in a catastrophe. In the SMART triage the operator, with a simple hit of eye, sets a sequence of five questions following the ABCDE of the ATLS approach, appraising the vital functions and using in some cases the alone pulsioximeter. According to the gotten answers it attributes a code: Green - Yellow - Red and Advanced Red. In case of death there is death's diagnosis effected by the physician. The SMART triage has been used during the earthquake in Indonesia of 2006 and Abruzzo 2009, during the assistance to the assembly of the young Agorà 2007 to Loreto (Italy) and to the exercise regional Mountains Blue to Macerata Italy of the 2008.

Material and Methods: We have compared four types of triage used in disasters (SMART, START, FAST, SORT) with the triage used in Emergency Department of the Regional hospital in Ancona (Italy). We have analyzed 254 cases sampling the subjects in sequential way, considering all the introduced patients, with the alone exclusion of the white codes, in a period of 9 days maintaining the same time-frame.

Results: Of the 254 analyzed with the normal hospital triage the 1,6% red code resulted, 26,8% yellow and 71,7% green. With the triage START the 0,8% red code resulted, 24,4% yellow and 74,8% green. With the triage FAST 2,4% red code resulted, 7,9% yellow and the 89,8% green. With the triage SORT the 0,8% red code resulted, 2% yellow and 97,2% green. Analyzing the 254 cases with the new triage SMART the 1,2% finally results red code, the 16,1% yellow and the 83,1% green.

Conclusion: From the use of the SMART adopted for the evaluation of the code of entrance in Emergency Department, we have deduced and confirmed the facility and the speed of use of this new model of triage. The triage SMART typically holds not only besides in consideration the traumatic pathologies but also internists that, it is an usable advanced triage both on the territory and in the hospital. We can classify the model SMART triage as a valid system in case of a disaster as is reliability and sensibility of assessment of patients result

to be more appropriate in comparison to the other models of triage taken in examination.

References: Champion HR et al.: Casualties. Disaster Medicine 1983; 1: 24-29. Role of Trauma Score in Triage of Mass. Nocera A.; Garner A.: System For The Future Based Upon Triage Mistakes Of The Past: the homebush triage standard. Aust. N.Z. J. Surg. (1999) 69, 603-608. An Australian Mass Casualty Incident Triage

Disclosure: No significant relationships.

TRAUMA REGISTRIES

M025 Analysis of Trauma Data Using an Advanced Statistical Method (Bayesian Network Approach)

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Introduction: The TRISS methodology is most widely used outcome prediction model but this methodology may have the point that does not accord in the country varying in traumatic injury form such as Japan. A Bayesian network is a probabilistic graphical model that represents a set of variables and their probabilistic independencies.

Material and Methods: We analyzed Trauma outcome factor from 40 factors using a Bayesian network approach and calculated New Japanese RTS and TRISS using statistical software "R" in the 20,181 cases data of Japan Trauma Data Bank (JTDB) from January 2004 to December 2007.

Results: The average patient age was 47.9 ± 23.5 years; 68.3% of the patients were men and 31.7% were women. The average ISS was 16.7 ± 13.9 , the average RTS was 6.70 ± 2.23 and the mortality rate was 12.2%. The major causes of trauma were traffic accident (45.3%), falls (19.9%) and lay down (11.6%). Blood transfusion, drinking, age, emergency medical technician and RTS were significantly correlated outcome. The degree of the correlation is shown by the thickness of the arrow. Bayesian network approach showed that emergency medical technician was most strongly correlated outcome, blood transfusion and drinking were strongly correlated outcome. Presence of emergency medical technician was particularly related to outcome in severe cases (ISS 31-75). Our calculated new RTS and TRISS were shown. 1. Original RTS is $0.9368 * GCS + 0.7326 * SBP + 0.2908 * RR$, our new Japanese RTS is $0.9013 * GCS + 0.7365 * SBP + 0.4668 * RR$. 2. Original TRISS Ps of penetrating cases is $1.24700 + 0.95440 * RTS - 0.07680 * ISS - 1.90520 * (age; if more than 55y.o)$, our new TRISS Ps of blunt cases is $2.19287 + 0.93251 * RTS - 0.07054 * ISS - 1.41778 * (age; if more than 55y.o)$. 3. Original TRISS Ps of blunt cases is $0.6029 + 1.1430 * RTS - 0.1516 * ISS - 2.6676 * (age; if more than 55y.o)$, our new TRISS Ps of blunt cases is $0.8050 + 0.7359 * RTS - 0.0717 * ISS - 0.8222 * (age; if more than 55y.o)$. Our

new RTS shown importance of respiratory rate and we suggested that Japanese TRISS coefficient showed the difference of the penetrating injury type not the blunt injury.

Conclusion: We showed that alcohol, massive bleeding needed blood transfusion and age were risk factor of trauma and Japanese emergency medical technician attendance was effective for trauma care. We suggested the reason of detachment by the injury form was that Japanese penetrating wound include many stab wound not gun shot wound.

References:

· American College of Surgeons Committee on Trauma: Resources for optimal care of the injured patient, Chicago, 1999. · American College of Surgeons Committee on Trauma: Resources for optimal care of the injured patient, Chicago, 1993.

Disclosure: No significant relationships.

M026 Influence of Pre-existing Co-morbidities on Trauma Mortality; An Analysis of 20257 Trauma Victims in Japan

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Introduction: Rapid aging of Japanese population is causing numbers of emerging problems in trauma patients care which consists of trauma in elderly people and increased pre-existing co-morbidities such as cardiovascular diseases, neoplasms and organ failures. Nevertheless, little is known about the relationship between co-morbidities and trauma. The aim of the study was to clarify the influences of co-morbidities on the trauma mortality, using data from the Japan Trauma Data Bank (JTDB), a multicenter, nationwide and prospectively recruited trauma registry in Japan.

Material and Methods: We selected the records from JTDB which fulfilled the requirements to estimate trauma injury severity score (TRISS) system. Logistic regression analysis after adjustment for baseline trauma severity based on TRISS system assessed the risk of in-hospital trauma death for following co-morbidities: hypertension (HT), diabetes (DM), psychotic disorders (PD), dementia (DE), stroke (ST), chronic obstructive lung diseases (COLD), bronchial asthma (BA), coronary diseases (CHD), congestive heart failure (CHF), liver cirrhosis (LC), chronic hepatitis (CH), chronic renal failure on dialysis (CRF) and active cancer (ACN). We conducted a couple of analysis which were adjusted or unadjusted by age in consideration for confounding between co-morbidities and elderly in age.

Results: A total of 8990 patients of 20257 trauma victims registered in JTDB matched the selection criteria and 10.7%, 5.2%, 6.7%, 1.6%, 2.7%, 0.4%, 3.5%, 2.1%, 1.1%, 0.6%, 1.1%, 0.6% and 0.8% of patients had HT, DM, PD, DE, ST, COLD, BA, CHD, CHF, LC, CH, CRF and ACN, respectively. Significant predictors of in-hospital death in the age adjusted model are LC (Odds ratio (OR): 6.5, 95% confidence interval (95%CI): 3.0-13.9) and CRF (OR: 2.6, 95%CI: 1.0-6.4), and the predictors in the age unadjusted model are ST (OR: 1.9, 95%CI: 1.2-3.2), COLD (OR: 4.4, 95%CI: 1.6-12.4), CHF (OR: 2.1,

95%CI: 1.0-4.3), LC (OR: 7.1, 95%CI:3.4-14.8), CRF (OR: 2.6, 95%CI: 1.0-6.3) and ACN (OR: 3.2, 95%CI: 1.3-7.9).

Conclusion: Pre-existing co-morbidities, especially, liver cirrhosis and chronic renal failure on dialysis worsen trauma mortality. We expect the novel model which can explain the effects of aging and co-morbidities on trauma mortality.

Disclosure: No significant relationships.

M027 Preventable Deaths and Errors in a Dutch Level-1 Trauma Center

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Introduction: Monitoring the quality of trauma care is frequently done by analyzing the preventability of trauma deaths and errors during trauma care. In the Academic Medical Center traumatic deaths are discussed during a monthly Morbidity and Mortality meeting. In this study an external multidisciplinary panel assessed the trauma deaths and errors in management of a Dutch Level-1 trauma center for (potential) preventability.

Material and Methods: All patients who died during or after presentation in the trauma resuscitation room in a two year period were eligible for review. All information on trauma evaluation and management was summarized by an independent physician. An external multidisciplinary panel individually evaluated the cases for preventability of death. Disagreements in classification were resolved during two consensus meetings. Potential errors or mismanagements during the admission were classified for type, phase and domain. Overall agreement on (potential) preventability was compared between the panel and the AMC consensus.

Results: Of the 62 evaluated trauma deaths one was judged preventable and 17 were judged as potentially preventable by the review panel. Overall agreement on preventability between the review panel and the AMC consensus was moderate (Kappa 0.51). The classification of the panel was more favourable than the AMC consensus. The interobserver agreement between the review panel members was also moderate (Kappa 0.43). The panel judged 31 errors to have occurred in the (potential) preventable death group and 23 errors in the non-preventable death group. Most frequently mentioned errors were related to choice or order of diagnostics, rewarming of hypothermic patients, and correction of coagulopathies.

Conclusion: The preventable death rate in the present study was comparable to the available literature. External review does not seem necessary to improve our current internal reviewing system. However, multidisciplinary reviewing of our trauma deaths provided us potential insights to optimize trauma care.

Disclosure: No significant relationships.

M028 Epidemiology of Fatal Trauma in Italy

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Introduction: Population based data have contain readily available, alphanumeric-coded information and allow easy and low-cost analyses¹. We investigated mortality following trauma using national registries and all trauma death cases, which occurred in Italy during 2002.

Material and Methods: Trauma mortality, in pre-hospital and in-hospital settings and death time from injury have been calculated for Italy during 2002 by cross-analyzing two national databases: the Death Certificates Register (DCD) and the Hospital Discharge Register (HDR). All diagnoses code from 800.0 to 939.9 and from 950.0 to 959.9 from both DCD and HDR, with the exclusion of femur fractures (820.0 and 821.9) if older than 65, have been included.

Results: The total number of people who died during 2002 as a consequence of trauma in Italy was 15,456: 43.5% older than age 64, and 35.9% belonging to the 15-44 age group. The overall incidence rate of trauma death has been 27.23 per 100,000 inhabitants/year with a relative risk of men vs women of 2.3. Analysis of time distribution of trauma deaths showed 46.8% of pre-hospital mortality, 18% of deaths within 48 h from hospital admission (acute mortality), 11.2% of deaths occurred between 3 and 7 seven days (early mortality), 24.0% of patients deceased after 7 days (late mortality). Patients deceased before hospital arrival were younger and the proportion of men was higher than deaths that occurred after hospital arrival.

Conclusion: The incidence rate of trauma death of 27.23/100,000 is higher if compared with similar population-based studies related to the same period² and a high pre-hospital trauma mortality and a lower level of acute hospital mortality, has been recorded. Italian data show a tri-modal distribution, with a low level of acute and early hospital deaths and a high level of late deaths. Data recorded during 2007 in Milano, where a new trauma system has been introduced, show a tendency to decrease of both pre-hospital and in-hospital deaths, with an incidence rate of 22.36/100,000. Moreover, the pre-hospital mortality has decreased from 47.8% to 38.7%.

References: 1. Westhoff J, Hildebrand F, Grotz M, Richter M, Pape HC, Krettek C: Trauma care in Germany. *Injury* 2003; 34: 674-83 2. Creamer GL, Civil I, Koelmeyer T, Adams D, Cacala S, Thompson J: Population-based study of age and causes of severe injury in Auckland, 2004. *ANZ J Surg* 2008; 78: 995-98 3. McGwin G, MacLennan PA, Fife JB, Davis GG, Rue LW 3rd. : Pre-existing conditions and mortality in older trauma patients. *J Trauma* 2004; 56: 1291-96 4. Meislin H, Criss EA, Judkins D, Berger R, Conroy C, Parks B, Spaite DW, Valenzuela TD.. Fatal trauma: the modal distribution of time to death is a function of patient demographics and regional resources. *J Trauma* 1997; 43: 433-40

Disclosure: No significant relationships.

M029 The Long Term Effects of an Early Analysis of a Trauma Registry

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Introduction: We established a trauma registry in 2003 to collect data on trauma patients, which is a major cause of death in the United

Arab Emirates (UAE). The aim of this paper is to report on the long term effects of our early analysis of this registry.

Material and Methods: Data in the early stages of this trauma registry were collected for 503 patients during a period of 6 months in 2003. Data was collected on a paper form and then entered into the trauma registry using a self-developed Access database. Descriptive analysis was performed.

Results: Most were males (87%), the mean age (SD) was 30.5 (14.9). UAE citizens formed 18.5%. Road traffic collisions caused an overwhelming 34.2% of injuries with 29.7% of those involving UAE citizens while work-related injuries were 26.2%. The early analysis of this registry had two major impacts. Firstly, the alarmingly high rate of UAE nationals in road traffic collisions standardized to the population led to major concerns and to the development of a specialized road traffic collision registry three years later. Second, the equally alarming high rate of work-related injuries led to collaboration with a Preventive Medicine team who helped with refining data elements of the trauma registry to include data important for research in trauma prevention.

Conclusion: Analysis of a trauma registry as early as six months can lead to useful information which has long term effects on the progress of trauma research and prevention.

Disclosure: No significant relationships.

M030 Features of Pulmonary Embolism in Trauma Patients

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Introduction: Trauma patients are recognized to be at increased risk for thrombo-embolic complications such as the development of a pulmonary embolism (PE). We reviewed our contemporary experience with PE with regard to its incidence, associated injuries, presenting symptoms, method of diagnosis and timing of occurrence at our Level 1 Trauma Center.

Material and Methods: This study was carried out at an American College of Surgeons (ACS) verified Level 1 Trauma Center. Trauma registry records over a 7 year period (2002 to 2008) were reviewed to identify patients that had experienced PE as a complication of trauma. Patient's charts were reviewed for demographic information, injury specific data, length of stay, method of diagnosis, symptoms related to pulmonary embolus and mortality.

Results: Over the seven year period there were the 19,529 trauma admissions to our Level 1 Trauma Center. PE was identified in 142 patients – an incidence of 0.7%. The mean age of occurrence was 48yrs. Males accounted for 73% of the PE patients. The mean Injury Severity Score was 19. Lower extremity long bone fractures (34%), spine fractures (32%) and rib fractures (30%) were the most common associated injuries. PE occurred within the first week of admission in 53% of patients. Overall, 62% of patients with PE had undergone some sort of operative procedure and 47% of these patients experienced a PE within the first week of operation. The most common symptoms associated with PE were respiratory distress/shortness of breath (27%), hypoxia (23%) and chest pain/tightness (13%). The diagnosis was most commonly made using a

chest computed tomography - pulmonary embolus protocol (70%). Of the 20 deaths (14%), the diagnosis of PE was made at autopsy in 17 (85%).

Conclusion: PE remains a significant complication following traumatic injury and occurred within the first week of admission in over 50% of cases in this series. Up to 33% of patients with PEs may not have associated symptoms. Early consideration should be given to the use of prophylactic inferior vena cava filters in patients with contraindications to chemoprophylaxis such as head injured patients.

Disclosure: No significant relationships.

M031 The Czech National Paediatric Trauma Registry

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Introduction: The Czech National Paediatric Trauma Registry (NPTR) is based on the Czech Trauma Registry (TR) which was established in 2004. Since 2008 all data on paediatric multiple traumas collected at Paediatric Traumatology Centres (PTC) has been entered into NPTR. It was the first complex data set that could be used for analysis. As the data output is detailed and accurate, it shows great promise for proper functioning of the registry.

Material and Methods: Since 2009 data on all paediatric traumas requiring hospitalization has been accumulated at CDT all over the Czech Republic. The analysis of 2009 data will thus be even more complex. From 2010 data should be collected from all medical institutions across the country. The analysis of multiple traumas in 2008 covers 7 basic areas: • General data overview • Injury severity • Access to medical emergency services • Traffic accidents • Protective equipment • Procedures • Comparison with death registry

Results: In 2008 there were 256 valid entries. Multiple traumas in children most frequently result from traffic accidents (N = 141 - 55%). Traffic accidents constitute 46.4% of all injuries and they account for more serious injuries compared to other trauma types. The occurrence of multiple traumas varies over days and years, with a tendency to increase in summer. In 2008 CDT recorded 7 deaths due to multiple trauma.

Conclusion: The new National Pediatric Trauma registry is most important source for trauma care monitoring, trauma prevention and data collection for general trauma analysis.

Disclosure: No significant relationships.

M032 Impact of Collective Skating on Natural Ice in the Netherlands on Emergency Care, Health Care and the Society

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Introduction: Ice-skating at open-air is a collective and traditional event in Holland. In January 2009, approximately half a million people went for ice-skating at open-air through the lowlands of Holland. As a result of this, approximately 13,000 patients have been

treated at a Dutch emergency department; the peak of ice-skating related injuries occurred during January 9-11th of 2009.

Material and Methods: Retrospective analysis of all patients who attended at our emergency department during 9-11th of January 2009 as a result of injuries related to skating on natural ice. We analysed epidemiological aspects, diagnostically examinations, prevalence of injuries per anatomical location as well as the necessary therapeutic interventions and costs for national health services.

Results: Injuries related to skating on natural ice accounted for 47% of all 259 attendances. The mean age for men and women did not significantly differ (43.2 and 42.5 years resp.; $p < 0.05$), but adults aged 41-60 years are more prone to injuries. Women were affected in 60%. Radiological examinations were requested in 94% (87% X-rays; 7% CT-scans). The upper extremity was affected in 75%, with the wrist accounting for 64% of those injuries. Fractures accounted for 79% of all ice-skating related attendances. An operative therapy was indicated in 23%. The mean costs for national health services were €1416 per patient.

Conclusion: Fractures, especially those of the upper extremity, were the predominate type of injury as a consequence of collectively performed skating on natural ice. This incidence is >2 times higher compared to fractures occurred during skating on artificial ice-rinks [2]. Wearing wrist guards is an effective tool in protecting skaters against injuries. We recommend wearing wrist guards during skating on natural ice [1, 4]. Especially (employed) adults aged 41-60 years are very prone to injuries resulting in a high loss of work days [2]. In contrast to children, adults might be more accessible for wearing protectors [3]. In future it seems reasonable for national health services to provide steps to increase public awareness on the benefits of prophylactic safety measures. This might result in a substantial reduction of costs for health care and society.

References: [1] C.L. Knox and R.D. Comstock. Video analysis of falls experienced by paediatric iceskaters and roller/inline skaters, *Br J Sports Med* 2006; 40: 268-271. [2] M. Lember and A. Tamm. Implications of two newly opened ice rinks on an accident and emergency department, *Br Med J* 1988; 296: 96. [3] J. de Nooijer et al. Why young Dutch in-line skaters do (not) use protection equipment. *Eur J Public Health* 2004; 14: 178-181. [4] R.A. Schieber et al. Risk factors for injuries from in-line skating and the effectiveness of safety gear, *N Engl J Med* 1996; 335: 1630-1635.

Disclosure: No significant relationships.

POLYTRAUMA

M033 Damage Control in Severely Injured Trauma Patients? A Ten-year Experience

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Introduction: The damage control concept is well established for the management of severely injured patients. This study reviews our institutional experience with damage control management and investigates risk factors for early mortality in these patients.

Material and Methods: The trauma registry of our level I trauma centre was utilized to identify all adult patients (age > 16 years) from January 1, 1996, through December 31, 2005 who underwent initial damage control procedures (thoracic, abdominal or pelvic packing and/or external fixators). Demographics, clinical and physiological parameters, associated injuries, and outcomes were abstracted. Patients were categorized as early survivors (surviving the first 72 h after admission) and early deaths. Stepwise logistic regression analysis was performed to identify independent risk factors for early mortality.

Results: During the study period, 319 patients underwent damage control management. Overall, 52 patients (16.3%) died within the first 72 h after admission (early deaths) due to head injuries (n = 28), hemorrhagic shock (n = 18), and multiple organ failure (n = 6). The remaining 267 patients (83.7%) survived the first 72 h (early survivors). Early deaths showed significantly deranged serum lactate (5.81 ± 0.55 vs. 3.46 ± 0.13 mmol/L; $p < 0.001$), base deficit (10.10 ± 0.95 vs. 4.90 ± 0.28 mmol/L; $p < 0.001$) and pH (7.16 ± 0.03 vs. 7.29 ± 0.01 ; $p < 0.001$) levels compared to early survivors on hospital admission. A prolonged prothrombin time, base deficit > 3 mmol/L, AIS head ≥ 3 , body temperature < 35°C, serum lactate > 6 mmol/L and hemoglobin < 7 g/dL proved to be independent risk factors for early mortality on admission to hospital ($R^2 = 0.45$).

Conclusion: Several risk factors for early mortality such as severe head injury and the lethal triad (hypothermia, coagulopathy and acidosis) in severely injured patients undergoing damage control procedures were identified and should trigger the trauma surgeon and the intensive care physician to initiate and maintain aggressive resuscitation.

Disclosure: No significant relationships.

M034 Alcohol and Multiple Trauma. Is There Any Influence?

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Introduction: Recent studies demonstrate increasing mortality and morbidity in alcoholised burn patients, beneficial effects were described in patients with traumatic brain injury. The effect of acute ethanol intoxication in polytrauma patients is unclear. We therefore

analysed clinical course and outcome in intoxicated as compared to non-intoxicated polytrauma patients.

Material and Methods: Inclusion criteria: ISS > 16, age 16-65 years, primary admission at our level-1 trauma centre. Ventilation time, ICU treatment, in-hospital days and plasma IL-6 levels were analysed. Incidences of SIRS, Sepsis, MODS and mortality were evaluated. Groups: A- (0‰) vs. A+ (> 0.1‰) and ranges (0.1-0.5‰; 0.5-1‰; 1-1.5‰; 1.5-2‰; 2-2.5‰; 2.5-3‰). Day comparisons as well as logistic and multiple regression analysis were performed.

Results: 437 patients were included (330 A-, 107 A+). Age, injury severity and distribution were comparable. No differences in ventilation time, ICU-treatment and in-hospital days were detected. Incidences of MODS, SIRS and sepsis were comparable in all groups. There was a predominance of male gender with increasing ethanol levels. Additionally, increased age was found with increasing ethanol levels.

Conclusion: Acute ethanol intoxication on admission did not influence clinical course or outcome polytraumatised patients. Interestingly, we could not detect differences in injury severity or pattern in intoxicated patients. However, the number of patients suffering multiple injuries due to ethanol intoxication remains unclear.

Disclosure: No significant relationships.

M035 Influence of Alcohol Abuse and Liver Cirrhosis on Outcome in Multiple Trauma Patients

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Introduction: Liver cirrhosis has been shown to be associated with impaired outcome in patients who underwent elective surgery. We therefore investigated the impact of alcohol abuse and subsequent liver cirrhosis on outcome in multiple trauma patients.

Material and Methods: Using the multi-center population-based Trauma Registry of the German Society for Trauma Surgery, we retrospectively compared outcome in patients (ISS > 9, > 18) with pre-existing alcohol abuse and liver cirrhosis with healthy trauma victims in univariate and matched-pair analysis. Means were compared using Student's t-test and analysis of variance (ANOVA) and categorical variables using χ^2 ($p < 0.05$ = significant).

Results: Overall 13,527 patients met the inclusion criteria and were, thus, analyzed. 713 (5.3%) patients had a documented alcohol abuse and 91 (0.7%) suffered from liver cirrhosis. Patients abusing alcohol and suffering from cirrhosis differed from controls regarding injury pattern, age and outcome. More specific, liver cirrhotic patients showed significantly higher in-hospital mortality than predicted (31% vs. predicted 19%) and increased single- and multi organ failure rates. While alcohol abuse increased organ failure rates as well this did not affect in-hospital mortality. Of note, alcohol abuse significantly decreased 24-hour mortality.

Conclusion: Patients suffering from liver cirrhosis are at maximised risk for impaired outcome after multiple injuries. Pre-existing

condition such as cirrhosis should be implemented in trauma scores to assess the individual mortality risk profile.

Disclosure: No significant relationships.

M036 Missed Injuries in Major Trauma Patients at an European Level I Urban Trauma Centre

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Introduction: Early in-hospital treatment of severely injured patients has been internationally standardized by the implementation of algorithms such as the ATLS®-concept. However, due to lack of time, the instability of the patients and the complexity of injuries, there is a risk that some lesions will be missed at this stage. The purpose of our study was to evaluate the incidence and significance of these missed injuries.

Material and Methods: Retrospective chart analysis (in-hospital and follow-up as outpatient) of data prospectively collected via an Access®-based documentation system was performed. Missed injuries were determined as injuries not found during primary and secondary survey.

Results: From January 2006 to December 2008 a total of 1,397 patients were admitted with suspicion of multiple trauma and thus, analysed. The mean Injury Severity Score was 16.3 + 14.2 points. Overall 165 missed injuries were detected in 102 (7%) of all patients, whereof 51 (31%) were rated as major injuries and 4 (2%) as life threatening (tension pneumothorax, splenic rupture (2), rupture of the liver). Thirty-two (19%) of the missed injuries required an operative intervention.

Conclusion: In spite of improvements in trauma team training and in radiological diagnostics, in particular the inclusion of initial spiral CT, missed injuries still represent a problem in multiple injured patients.

Disclosure: No significant relationships.

M037 Complications in Multitrauma Patients in a Dutch Level-1 Trauma Center

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Introduction: Complication registration is important for monitoring the quality of health care. Aim of this article was to describe the incidence, type and impact of complications occurring within 6 months after the initial trauma in multitrauma patients. Second, we assessed potential risk factors for the occurrence of complications.

Material and Methods: During a 2-year period all trauma patients presented to the Academic Medical Center and having an Injury

Severity Score of ≥ 16 were included. Patients who were directly transferred to other hospitals were excluded. We used the prospective Dutch National Surgical Complication Registry of the AMC, a Level-1 trauma center, to assess complications within 6 months after the initial trauma. For verification we additionally performed a chart review and searched the decubitus specialists- and ICU registration. Complications were graded 0 (no real health loss) to 4 (lethal). Identification of risk factors associated with an increased risk of complications was performed by univariate analysis.

Results: 303 multitrauma patients were included with a median ISS of 22 (IQR 17-29). Within 181 patients 358 complications occurred (60%). Most complications (73%) were grade 1 and resolved completely without operative (re-)intervention. Of the 261 grade 1 complications 101 were infectious, of which 33 urinary tract infections, 34 pneumonias, 18 wound infections, and 6 septic complications. Other grade 1 complications included one multiple organ failure and 35 single organ failures. 18 patients had decubital ulcers. There were 27 psychiatric complications and 10 auto-extubations. 27 patients (8%) had grade 2 complications which required operative (re-)interventions including 12 skeletal complications. All eight grade 3 complications causing (potential) permanent damage or disability were of neurological origin (2%). Overall, 57 patients died (18.8%) of whom 13 in the trauma room. 12 patients had a complication associated re-admission (4%). Emergency interventions, age and ISS ≥ 45 tended to be associated with the occurrence of complications. In patients with complications median hospital stay was doubled from 8 to 18 days.

Conclusion: The incidence of complications in multitrauma patients is considerable when using our strict criteria. Most frequent complications are infections of respiratory and urinary tract. The majority of complications resolved completely without an intervention. High ISS and emergency interventions appear to be associated with developing complications in multitrauma patients. Hospital stay in patients with complications is doubled.

Disclosure: No significant relationships.

M038 Searching for Unexpected Trauma Deaths Using TRISS Methodology

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Introduction: Trauma represents the first cause of death for patients less than 45 years of age in EU and USA. A patient's probability of survival is dependent upon at least four elements: anatomic injury severity, physiologic reserve, intrinsic host factors and a quality of care. The trauma injury severity score (TRISS) has been used for over 20 years for retrospective risk assessment in trauma population. Recognition and analyze of unexpected trauma deaths can improve a quality of trauma care.

Material and Methods: We analyzed data for patients died after trauma in 4 years period (January 1st, 2004 – December 31st, 2007) in General Hospital Karlovac, Croatia (Level II Trauma Center). Only the patients older than 18 years with fully available data were including into the study. Dead on arrival were excluded.

Results: We analyzed data for 35 patients, 27 (77.1%) male and 8 (22.9%) female with a median age 48.2 years (range, 20 – 83 years). Dominant injury was in the region of head in 21 (60%), chest 8 (22.9%), abdomen 4 (11.4%) and extremities in 2 (5.7%) traumatized patients. Eighteen patients (51.4%) died in the first 24 h after

admission. Nineteen patients (54.3%) had probability of survival according TRISS methodology over 50%. We also analyzed an autopsy findings of these patients and found that 7 of 19 (36.8%) had a difference between clinical and autopsy ISS. The most frequent missed injury were rib fractures. Six of these 7 patients were hospitalized in a period when we did not use MSCT routinely in multiple injured patients.

Conclusion: TRISS is not a clinical prognostic tool but is used retrospectively for clinical and epidemiological research, performance evaluation, and resource allocation. It is required as a basis for quality assessment and improvement. In combination with autopsy findings, TRISS methodology can be an valuable tool for recognition of unexpected trauma deaths and further analyze of possible treatment errors.

References: 1. Boyd C, Tolson M, Copes W: Evaluating trauma care: the TRISS method. *J Trauma* 1987; 27: 370-8. 2. Champion HR, Copes WS, Sacco WJ et al.: The Major Trauma Outcome Study: establishing norms for trauma care. *J Trauma* 1990; 30: 1356-65. 3. Demetriades D, velmanos G, sava J. TRISS methodology: an inappropriate tool for comparing outcomes between trauma centers. *J Am Coll Surg* 2001; 193: 250-4.

4. Kilgo PD, Meredith JW, Osler T: Incorporating recent advances to make the TRISS approach universally available. *J Trauma* 2006; 60: 1002-9. 5. Clark DE, Winchell RJ: Risk adjustment for injured patients using administrative data. *J Trauma* 2004; 57: 130-40,

Disclosure: No significant relationships.

M039 Positive Personal Characteristics Predicts Good Quality of Life After Acquired Severe Injuries

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Introduction: This study considers positive personal characteristics as possible predictors of quality of life (QoL) in a sample of severely injured individuals.

Material and Methods: Data was collected from individuals with spinal cord injuries (SCI) and/or multiple traumas (MT) at admission and at discharge from rehabilitation, and four years post injury. The main outcome measure was the Sickness Impact Profile (SIP), and positive personal characteristics, such as optimism, positive affect and resilience was assessed by Life Orientation Test-Revised, Positive Affect and Negative Affect Schedule, and Resilience Scale for Adults. **Results:** According to SIP, functional impairment was most evident within the categories of work, recreation and pastimes, sleep and rest, and home management. Individuals with a MT had better QoL compared with individuals with SCI four years post injury. QoL was associated with optimism, positive affect, anxiety, depression, pain, and resilience. Being optimistic at admission and being resilient later in the course predicted good QoL.

Conclusion: The main finding of the study was that positive personal characteristics, such as optimism and resilience, predicts good QoL four years after acquiring a severe physical injury. This supports the need to look at the full spectrum of human characteristics, not only

risk factors and impairments, when we seek to find out what predicts QoL. By expanding the QoL outcomes analyses after acquired severe injuries, to investigate the impact of positive personal characteristics such as optimism, positive affect, and resilience, this study fills a gap in the literature.

Disclosure: No significant relationships.

M040 Outcome After Severe Polytrauma (ISS \geq 50)

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Introduction: What prognosis have severely injured patients?

Material and Methods: All severely injured patients with an Injury Severity Score (ISS) \geq 50 were identified in a 6-year-period between 2000 and 2005 in an European level 1 Trauma Center. Data were evaluated from German trauma registry and Polytrauma Outcome Chart (POLO-chart) of the German Society for Trauma Surgery and a personal interview to assess working ability and disability and are presented as average.

Results: 88 out of 1435 evaluated patients after severe polytrauma demonstrated an ISS \geq 50 (6.5%), among them 23% women and 77% men. 75% had an ISS of 50-60, 16% 61-70, and 9% \geq 70. In 27% trauma was caused by motor bike accidents. 3.6 body regions were involved. Patients had to be operated 5.3 times and were treated 23 days in the ICU and stayed 73 days in hospital. Mortality rate was 36% and rate of multi-organ failure 28%. 15% demonstrated severe sensorimotor dysfunction as well as residues of severe head injury. 25% recovered well or at least moderately. 29 out of 56 survivors answered the POLO-chart. A personal interview was performed with 13 patients. The state of health was at least moderate in 72% of patients. In 48% interpersonal problems and in 41% severe pain was observed. In 57% problems in working ability concerning duration, as well as quantitative and qualitative performance were observed. Symptoms of post-traumatic stress disorder were found in 41%. The more distal the lesions were located (foot/ankle) the more functional disability affected daily life. In only 15%, working ability was not impaired. 8 out of 13 interviewed patients demonstrated complete work disability.

Conclusion: Even severely injured patients after polytraumatization have a good prognosis. The ISS is an established tool to assess severity and prognosis of trauma, whereas prediction of clinical outcome cannot be deducted from this score.

Disclosure: No significant relationships.

EDUCATION

M041 The TEAM Course in the Central Region of Portugal Planning, Development and Results After 54 Courses

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Introduction: It is clear, over recent years, a reinforced interest around emergency training in general and trauma in particular. In

this context was the creation in 2003, by the Portuguese Medical Association (Ordem dos Médicos), of the College of Emergency Medicine. As to the Portuguese Society of Surgery (SPC), naturally interested in trauma, that has been able to bring to Portugal, in 1999, the ATLS (Advanced Trauma Life Support Course) course of the American College of Surgeons (ACS). Since then, under its aegis, about 140 courses have been organized by nine different centres around the country for more than 2200 doctors of different medical specialties. The TEAM (Trauma Evaluation and Management, ACS) course is a scaled down version of ATLS for students.

Material and Methods: In its original form the TEAM course is a scaled down version of ATLS for students. It consists in a theoretical session supported by a manual and a video. In Portugal the Center Region pioneered in supporting this initiative, having TEAM accompanying the regional start of the ATLS in 1999-2000. In subsequent years, with the new format proposed by the ATLS Commission of SPC, it began also in the South and the North Regions. In addition to the lecture and video session, there are also skill stations (airway/ventilation, shock/immobilisation and others). Teaching has always been done by ATLS instructors, supplemented by colleagues that have done the ATLS. With this new model, in the central region of Portugal – in Coimbra, Covilhã and Viseu (with Piaget University of Luanda, Angola) – 54 TEAM courses have been frequented by nearly 1300 students.

Results: It is this pedagogical experience that we are presenting, based on evaluations and feedback from participants collected anonymously. More specifically, we had them applied for an overall assessment and an assessment of the various sessions, on a scale of 0 to 3 (bad, reasonable, good and very good), as well as additional comments. Results: lecture – 2.71/video – 1.65/airway – 2.91/shock – 2.75/immobilisation – 2.81/case presentations – 2.85/global assessment – 2.89. Critics: lack of time (51%), educational in English (22%), poor quality of the video (15%), insufficient practical material (07%), lack of pictures (02%).

Conclusion: Although the results are extremely rewarding for organizers and teachers, it has been taken into account the weak classification of the video and the criticism to the lack of time and, also, to the educational material in English, trying to raise the ACS to the need for Portuguese language editions.

References: 1. Advanced Trauma Life Support for Doctors. ATLS Student Course Manual, 8th edition. Chicago 2008 2. Trauma Evaluation and Management Program for Medical Students. TEAM Student Study Guide, 2nd edition. Chicago 2005

Disclosure: No significant relationships.

M042 One-Team-One-Hospital Training Course for the Management of Severe Trauma: A New Tailored Course for a Single Institution Assisted by a Professional Facilitator Aimed to Improve the Trauma Team Performance

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Introduction: One of the most common cause of preventable deaths in severe trauma is represented by delay in diagnosis and treatment of injuries, therefore a good teamwork aimed to reduce time consumption and errors is essential. There is in fact good evidence that the outcome of trauma care depends on effective trauma team performance (TTP). Critical points during trauma management are represented by lack of leadership, information sharing, difficult communication and decision making. To improve TTP, advanced simulators with full scale realistic patients (1) and trauma crew resource management (CRM) educational programmes are increasingly being used.

Material and Methods: We made a survey among health care professionals (HCP) from 9 different level I and level II trauma centers in the Milan area that confirmed that difficulties in communication and conflictual behavior during trauma action is perceived as a barrier to ideal management. After a focus group interview to establish the need to improve performance we tested in our hospital a tailored trauma teamwork course using an advanced human patient simulator. The peculiarity of this course is the recreation of the same location of the trauma bay using same trauma team components and teamwork laboratory conducted by a professional coach as facilitator for the teamwork. This role is particular important since with this facilitation HCP can reach the awareness of wrong attitudes that lead to errors and bad performance. In particular, the tasks of the facilitator were the following: to help people understand their common goals to assist the Trauma Team to plan to achieve common goals to assist the group in achieving a consensus of any disagreements that preexist or emerge in the meeting so that it has a strong basis for future action. A second survey few months after the course was made among HCP of our institute to evaluate the possible improvement of the TTP.

Results: The second survey confirmed a perceived benefit among HCP who started to work in a proactive manner. In particular 78% of HCP reported the feeling of a better TTP and 86% suggested regular practice with advanced simulation.

Conclusion: Integration of a tailored advanced simulation and a facilitator assisted teamwork could be a powerful method to improve quality of treatment in trauma patients. A score index to evaluate the improvement of the TTP during the course and in reality is although needed and is under evaluation.

References: 1. Holcomb JB, Dumire RD, Crommet JW, Stamateris CE, Fagert MA, Cleveland JA, Dorlac GR, Dorlac WC, Bonar JP, Hira K, Aoki N, Mattox KL Evaluation of trauma team performance using and advanced human patient simulator for resuscitation training. *J Trauma* 2002 Jun; 52(6): 1078-85

Disclosure: No significant relationships.

M043 Introduction of Our Residency Program for Acute Care Surgeon

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Introduction: Our university hospital is one of the only two national university hospitals in Tokyo and our emergency medical center is one of the busiest emergency center in Japan that receives 25 to 30 ambulances per day. Japan has a quite unique emergency medical

system in the world. In Japan, emergency patients are stratified into 3 tiers, minor-primary, moderate-secondary, severe-tertiary. Japanese emergency doctor, that is not same as the emergency physician in the USA, take care only for the most severe emergency cases, tertiary level emergency patients. And if they find out the patient who needed an emergency operation, then they do the surgery by themselves. If the patients need to admit to ICU, they take care the patient in ICU by themselves. This unique system was installed in mid-1970 s. Japanese emergency doctors do not only trauma cases, but also non-trauma severe emergency cases. For talking about trauma, they do not only the initial management of trauma patients but also do emergency surgery and trauma critical care.

Material and Methods: Based on this historical situation of emergency medicine and trauma management in Japan, our institution has developed a new training program for trauma surgery residents.

Results: Residency program for Acute Care SurgeonTMs Track After completion of 1½ yearsTM National Postgraduate Training Program 1 year; Surgical/Trauma Critical Care 2 years; At university hospital 2-3 years; Core general surgery 2 years; At community hospital with high patient volume 2 years; Mainly belonging to general surgery 2 years; Rotating several surgical specialties such as 2 years; Cardiovascular, Lung, Pediatric 2 years; Obtain JSS board certification 2 years; Acute care surgery 2 years; At university hospital 2 years; Take on call for Trauma/emergency operation 2 years; More involved in emergency medicine/critical care medicine 2 years; Obtain JAAM board certification This program started in 2007. Surprisingly this is quite similar to that of 24-Month Curriculum for Acute Care Surgical Training that is developed by The AAST committee on Acute Care Surgery. They demand critical care training and also super-rotating several sub-specialty of surgery.

Conclusion: Our Next Steps 2 years; Surgical society dedicated to emergency surgery in Japan and implementation of board certification for Acute Care Surgeons. 2 years; Trauma patient volume for each tertiary emergency medical center is a main issue. Trauma center in Japan verified by JAAM and certified by local government.

Disclosure: No significant relationships.

M044 The Definitive Surgical Trauma Care (DSTC) Course in Portugal

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Introduction: It has been clear in recent years a reinforced interest around trauma and emergency training. In this context, the Portuguese Medical Association (OM) has created, in 2003, the Competence College on Emergency Medicine (CCEM). Just as important, the Portuguese Society of Surgery (SPC) brought, in 1999, the ATLS (Advanced Trauma Life Support) Course of the American College of Surgeons (ACS) and managed to run, since then, about 140 courses in nine different centres for more than 2200 doctors. The surgeons interest in this area had also expression through thematic societies such as the Portuguese Trauma Society (SPT), the Trauma Group (GT) of Hospital de São João and the Lusitanian Association for Trauma and Emergency Surgery (ALTEC), affiliated to the European Society for Trauma and Emergency Surgery (ESTES). Regarding trauma surgery and the surgical decision making, the GT had a pioneering role, in 2003, through a protocol with the Royal Australasian College of Surgeons (RACS), importing the Definitive

Surgical Trauma Care (DSTC) Course of the International Association for Trauma Surgery and Intensive Care (IATSIC).

Material and Methods: A memorandum of understanding (MOU) was signed between this entity and OM on 2008, to the creation of a National Steering Committee (NSC) for the development of the DSTC in Portugal, in cooperation with the existent trauma societies, all represented in the OM Working Group for Emergency Surgery (GTFCE). The MOU came into effect with the signatures of the appropriate representatives, acknowledging that four courses had been run in Portugal prior to its signature and that all future courses would be conducted in accordance with the essential requirements established by IATSIC. In practical terms, the first two courses run after signing the MOU must be of the form and nature as laid down by IATSIC. Thereafter, variations as determined by the NSC may be allowed. The slide material will be provided "locked". After the two initial courses, the "unlock" code will be provided. Details of all modifications must be lodged with the IATSIC. NSC will be responsible for ensuring the maintenance of high standards in the conduct of all courses and the selection of participants, ensuring that they meet the minimum standards as laid down by IATSIC. NSC is entitled to appoint two representatives at International Subcommittee meetings.

Results: At the end of 2009, eight DSTC courses will have been carried out in Portugal for almost 200 surgeons: three in Porto, with GT, four in Coimbra, with ALTEC, and one in Lisbon, with SPC.

Conclusion: The recognition of training models like this one, by OM and their inclusion in a future programme for the recognition of a Competence in Emergency Surgery, including trauma, is an important step that is now being carried out by the CCEM and GTFCE.

References: 01. Boffard KD. Manual of Definitive Surgical Trauma Care. Internacional Association for Trauma Surgery and Intensive Care. Arnold. London, 2003 02. Mesquita C. Depois da Emergência Médica, a Cirurgia de Emergência? Tempo Medicina. Lisboa, 7 de Junho 2006 02. Mesquita C. A Emergência Cirúrgica no contexto geral da Emergência – Do ATLS ao DSTC. Medicina de Emergência: dos princípios à organização, Volume II. Coimbra, Novembro 2006 03. Boffard KD. Manual Of Definitive Surgical Trauma Care, 2nd Edition. Internacional Association for Trauma Surgery and Intensive Care. Hodder Arnold. London, 2007 04. Mesquita C. Formação Específica em Cirurgia de Emergência e Trauma – Do ATLS ao DSTC. Separata ALTEC. Coimbra, Maio 2008

Disclosure: No significant relationships.

M045 Training Methods for Practical Skills in Undergraduate Surgical Education

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Introduction: Clinical skills must be to the fore of medical occupation, especially in surgery, where the mastery of basic skills is of great

importance for the young learner. The acquisition of basic clinical skills during surgery clerkships has been shown to be inadequate. This work presents an analysis of different teaching methods in a standardized training program for basic clinical skills in surgery.

Material and Methods: The program is part of a four week surgical rotation for 4th year medical students, consisting of the one-week training program in basic surgical skills and a three-week clerkship on surgical ward. During the skills training, a maximum of 6 students per group rotate through 12 modules. In a randomized study, the effects of different teaching modalities as skills lab, simulation and role play, as well as different teaching methods as four-step-approach, short-lecture, video were tested on their effect on theoretical and practical skills acquisition.

Results: A total of 60 students participated on a voluntary basis. The theoretical and practical examinations revealed significant differences in the acquired skills comparing the different teaching modalities and methods. The use of video as part of the 4-step approach was effective for training the basic skills such as suturing and wound care. Least effective for all skills were short-lectures.

Conclusion: The choice of teaching modality and method has a significant impact on students' skills acquisition and its long term retention.

Disclosure: No significant relationships.

M046 Organizing Trauma Team Simulation Training in Trauma Center: Where to Pay Attention to?

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Introduction: Systematic trauma team simulation training was started in Helsinki University Hospital in 2003. In terms of getting the optimal advantage of training and maintaining the justification of resource allocation, an advantageous balance in various team training principles has to be applied. The aim of the present study was to analyze the standardized written feedback given by trainees after training sessions.

Material and Methods: The study period was three years (2006-2008). The collected data consisted of a subjective self-assessment on the level of knowledge, skills, and team work in traumaresuscitation. Also a self-assessment on the effect of training on decision making, communication, skills, team work, and leadership, as well as a general rating of training session were collected. Self-assessment was done using five step scoring system from one to five. Results are presented as means.

Results: There were 48 trauma team simulation training sessions during the three year study period resulting in 315 filled feedback forms. In 145 cases (46%) the person was participating the training first time. The number of training session being two or more was 23 (48%) in team leader surgeons, 72 (76%) in nurses, 15 (31%) in radiographers, and 15 (25%) in anesthetists. The general rating of the training sessions was observed to be very good (mean 4.4). The subjective self-assessment on the need of individual knowledge and skill education revealed that the need was highest among the anesthetists (3.5). The enhancement in team work and communication was the most experienced benefit of training in all trauma team member professions (3.9). The smallest experienced benefit of training was in enhancement in technical skills (2.1). Enhancement in decision making and leadership was rated highest among team leader surgeons (3.8 and 3.8, respectively). Enhancement in team work and communication was rated highest by the anesthetists (4.1 and 4.0, respectively).

Conclusion: The results revealed training being experienced beneficial and motivating. There is an obvious need for the persons being in charge of major judgments in trauma resuscitation, such as surgeons and anesthetists, to gain information on different fields of trauma care. The enhancement in team work and communication was experienced as the most beneficial issue of training, thus meeting well the challenge of maintaining the focus on basic principles of crew resource management (CRM). The smallest experienced benefit of training was in enhancement in technical skills. This was not a surprise, thus team training sessions are not meant to be skills stations.

References: Lee S et al. Trauma assessment training with a patient simulator: a prospective, randomized study. *J Trauma* 2003; 54:100-105. Risser D et al. The potential for improved teamwork to reduce medical errors in the emergency department. *Ann Emerg Med* 1999; 33:100-105.

Disclosure: No significant relationships.

M047 MEC.O: Medical Education Online: A Key to the Knowledge Extension in the Student Training in Traumatology

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Introduction: In this document we describe a special e-learning project of the trauma surgery clinic at the University of Saarland/Germany: MECO (Medical education online).

Material and Methods: This e-learning concept was created as part of the students' education and it adds different e-learning content to the ever-expanding teaching and learning possibilities (practical lessons en bloc, practical seminars, practical year, voluntary additional lessons in surgery with multimedia learning and instructions by a tutor) in accident surgery in the course of their medical education.

Results: The student can choose between different steps of the e-learning module: e-lesson, video presentations of operations, video presentations of clinical examinations, Web-based links to an information pool and clinical case descriptions. Additionally, an examination on different levels is included. An additional private lesson for the best students completes the concept. An evaluation of the acceptance by our students produced very positive results.

Conclusion: We see e-learning as part of a blended learning concept. E-learning promotes a shift towards adult learning strategies in medical education, which are useful for lifelong learning in medicine. This changes the role of the teacher in medical education. Educators no longer serve solely as distributors of content, but become facilitators of learning and assessors of competency.

References: Wutoh R, Boren SA, Balas EA. eLearning: A review of Internet-based continuing medical education. *Journal Contin Educ*

Health Prof. 2004; 24:20-3033 Nattestad A, Attstrom R, Mattheos N, Ramseier C, Canegallo L, Eaton K, Feeney L, Goffin G, Markovska N, Schitteck M, Spohn E, Sudzina M. 4.1 Web-based interactive learning programmes. *Eur J Dent Educ.* 2002; 6, Suppl 3:127-137 Wiecha JM, Gramling R, Joachim P, Vanderschmidt H. Collaborative e-learning using streaming video and asynchronous discussion boards to teach the cognitive foundation of medical interviewing: A case study. *J Med Internet.* 2003; Res 5:e13 Citak M, Haasper C, Behrends M, Kupka T, Kendorf D, Hüfner T, Matthies HK, Krettek C. Webbasiertes e-learning-Tool in der unfallchirurgischen Lehre. Erste Erfahrungen und Evaluationsergebnisse. *Unfallchirurg*, online 13.02.2007-04-06 Wahlqvist M, Skott A, Björkelund C, Dahlgren G, Lonka K, Mattsson B. Impact of medical student's descriptive evaluations on long-term course development. *BMC Medical Education.* 2006; 6:24-35 Wong MS, Lemaire ED, Leung AKL, Chan F. Enhancement of prosthetics and orthotics learning and teaching through e-learning technology and methodology. *Prost Orth Int.* 2004; 28:55-59 Ruiz JG, Mintzer MJ, Leipzig RM. The impact of e-learning in medical education. *Acad Med.* 2006; 81:207-212 Vukovljak L. Closing the knowledge gap with e-learning. *J AHIMA.* 2002; 73/6:52-54

Disclosure: No significant relationships.

M048 Trauma Residency: Old Fashioned or Still up to Date for Trauma Training?

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Introduction: Surgeons apply special knowledge and skills during trauma patients management. According to population needs, the local Health Department has developed a trauma program to cover those purposes.

Material and methods: To describe the opinions of potential applicants regarding a post basic residency, focused on trauma.

A questionnaire composed by 4 questions was given to general surgery residents at the end of their basic training, while they were attending academic meetings. They had to answer about: trauma training during the basic residency (BR), references about authorized hospitals for trauma education, interest to enter a trauma residency and working possibilities after specialization.

Results: Between 01/06 - 30/11/2007, 62 general surgeon residents answered the questionnaire. Regarding the first statement, 83% of the residents got their trauma training during the BR, as institutional lectures, ATLS Courses and trauma workshops. 60% of the residents ignored the institutions allowed to teach this discipline and 68% of them didn't show interest in starting another residency. In contrast, 84% of the surgeons considered it convenient to get a job if they had special education in trauma care.

Conclusion: The low enthusiasm of young physicians in trauma management, represents a serious medical problem. Beside the trauma characteristics of each country, basic concepts must be agreed among the trauma societies, in order to organize the education of these professionals.

New strategies must deal with overwork, social restrictions and low income, all these problematic situations, conform drawbacks for the applicants at the moment of choosing a surgical specialty.

Disclosure: No significant relationships.

BIOMECHANICS

M049 Biomechanical Evaluation of Different Interspinous Devices on the Affected and Adjacent Segments

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Introduction: Interspinous spacer are supposed to extend and stabilize the spinal canal, but still allow flexion, lateral bending and axial rotation in the motion and the adjacent segments. The aim of the present study is the biomechanical evaluation of the change of mobility of the affected and adjacent segments after implantation of different interspinous devices under load in all directions of motion.

Materials and Methods: Eight fresh frozen human cadaver lumbar spines (L2–L5) were tested in a spinal testing device with a moment of 7.5 Nm in flexion/extension, lateral bending and rotation with and without a preload (follower load of 400 N). The ROM was measured after implantation of Aperius® (Kyphon, Mannheim), In-Space® (Synthes, Umkirch), X-Stop® (Tikom, Fürth) and Coflex® (Paradigm Spine, Wurmlingen) into the segment L3/L4.

Results: All interspinous devices caused a significant reduction of extension of the instrumented segment without significantly affecting the other directions of motion. The flexion was reduced by all implants only when the follower load was applied. All devices caused a higher ROM of the whole spine during lateral bending and rotation.

Conclusion: The actual evaluated interspinous devices led to a significant reduction of ROM during flexion–extension, but to a significant increase of ROM for the whole specimen (L2–L5) during lateral bending and rotation, which increases the risk of adjacent level degeneration. Therefore the decision for the optimal individual treatment should be made on the knowledge of the biomechanical effect of each device and the underlying disease of the patient's symptoms.

References:

Schmoelz W, Huber JF, Nydegger T, Dipl I, Claes L, Wilke HJ. Dynamic stabilization of the lumbar spine and its effects on adjacent segments: an in vitro experiment. *J Spinal Disord Tech.* 2003; 16(4):418–23.

Lindsey DP, Swanson KE, Fuchs P, et al. The effects of an interspinous implant on the kinematics of the instrumented and adjacent levels in the lumbar spine. *Spine* 2003;28:2192–97.

Wilke HJ, Drumm J, Häussler K, Mack C, Steudel WI, Kettler A. Biomechanical effect of different lumbar interspinous implants on flexibility and intradiscal pressure. *Eur Spine J.* 2008;(8):1049–56.

Bono CM, Vaccaro AR. Interspinous process devices in the lumbar spine. *J Spinal Disord Tech.* 2007;20(3):255–61.

Disclosure: No significant relationships.

M050 Deformation of Osteosynthetic Material in Bundle Nailing Technique. Computer Simulation

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Introduction: Aim of this study was to determine the best diameter of used implants, leading to maximal mechanical stability of osteosynthesis – prevention of failure of osteosynthesis.

Materials and Methods: Simplified model of osteosynthesis of humeral shaft fractures: system of two hollow tubes, filled with implants of same diameter, longitudinal dislocation in “fracture” 5 mm, length of model 300 mm, inner diameter of tubes 10 mm, material – surgical steel as defined by national standard specification, temperature 38 Dg, diameter of implants from 1.6 to 4.5 mm. Mathematic model was based on theory of fatigue of metals, studied system underwent bending oscillation cycles with 5 mm amplitude. There was observed total number of cycles leading to failure of first implant.

Results: These numbers of cycles leading to failure of first implant were observed: implant diameter 1.6, number of implants in system 31, number of cycles 35409; 1.8, 19, 31314; 2.0, 19, 30094; 2.2, 15, 29231; 2.4, 12, 27113; 3.0, 8, 25033; 4.5, 3, 22326.

Conclusion: There is indirect proportion between implant diameter and limits of mechanical stability of system. Best implant diameter in model was 1.6–2.2 mm. Best implant diameter for practical use is 2.0 and 2.2 mm (optimal filling of bone, technical limitation by implantation).

Disclosure: No significant relationships.

M051 Femoral Nail Bending After Intramedullary Nailing. Results of a Cadaver Study

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Introduction: Femoral intramedullary nails is considered as standard procedure for femoral fractures. Even complex fractures can be treated with intramedullary nails if locking nail techniques are used. Nevertheless, locking nail is a demanding technique due to distal targeting. The main problem of the distal targeting is to determine the position of the holes based on the deformities applied during nail insertion. They are only few paper of nail bending analysis in the literature. We do not currently know exactly how, how much and in which axes a femoral nail bends during insertion. The aim of this study is to determine how and how much a femoral nail bend during insertion into 20 intact femur of caucasian cadaver.

Materials and Methods: The method consists in determining the zero position of an external apparatus receiving a signal from the distal part of the nail. The nail (Sirius® nail 12x400 Zimmer Inc) is then inserted and the apparatus aligned to the signal emitted by the nail. Finally, one can measure the direction of bending and its displacement in millimeter.

Results: All nails bend anteriorly in the Z axis (AP deformity) from 2 to 17 mm (mean 12.2 mm). No or negligible deformity in the X axis (torsion deformity) are observed. Our system does not give information about Y axis (lateral) deformity.

Conclusion: This study is limited to a given nail and to Caucasian people. The nail deformities are well defined and mostly anterior in the frontal plan. There are no significant rotational deformities. Lateral deformities need to be investigated. This study gives new data for targeting comprehension.

References:

Krettek C, et al. The deformation of small diameter solid tibial nails with unreamed intramedullary insertion. *J Biomech.* 1997;30:391–94.

Disclosure: No significant relationships.

M052 A Dynamic Approach for Gait Analysis in a Murine Femur Fracture Model to Study the Biomechanical Effects of Femoral Fracture Stabilization

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Introduction: Gait analysis is a powerful tool to monitor the degree of convalescence in fracture care after fracture fixation and during bone healing. Because of the availability of a large array of monoclonal antibodies and gene-targeted animals, the mouse has become the preferred species for molecular studies on fracture healing. Of interest, gait analysis after fracture fixation and during the bone healing process has not been performed in mice yet. We present a novel technique for dynamic gait analysis in mice and report the change of motion pattern after femur fracture and fixation.

Materials and Methods: All animal procedures were performed according to the National Institute of Health guidelines for the use of experimental animals and were approved by the German legislation on the protection of animals. Ten CD-1 mice were divided into two groups: fracture group (n = 5) and control group (n = 5). All mice were anesthetized by an i.p. injection of xylazine (15 mg/bw) and ketamine (75 mg/bw). A standardized closed midshaft fracture according to AO-classification A2–A3 was stabilized by a common pin. The non-fractured tibia was additionally marked with a pin, allowing a measurement of the tibio-femoral angle by a digital video-radiography system recording 30 images/s. For the control group, one pin was inserted into the femur and one into the tibia without producing a femoral fracture. Dynamic gait analysis was performed at day fourteen after surgery in a X-ray compatible running wheel and the following gait parameters were determined: the minimum and maximum tibio-femoral angle, the stride frequency, the stride time, the stride length and the stride velocity. Eighteen representative strides per mouse were analyzed. All measurements were done using Osirix Imaging Software and the Open Source program ImageJ. All data are given as means ± standard error of the mean (SEM).

Results: Femur fracture fixation resulted in a significantly reduced maximum tibio-femoral angle ($96.6 \pm 1.2^\circ$ vs. $74.7 \pm 1.2^\circ$, $p < 0.05$) and a slightly reduced minimal tibio-femoral angle when compared to non-fractured controls ($41.6 \pm 1.4^\circ$ vs. $51.4 \pm 1.2^\circ$, $p > 0.05$). Stride frequency (4.8 ± 0.27 strides/s vs. 4.6 ± 0.3 strides/s, $p > 0.05$) and stride time (0.2 vs. 0.3 s, $p > 0.05$) were not affected. However, stride length was significantly reduced after fracture fixation (9.2 vs. 5 cm, $p > 0.05$), resulting in a reduction of the overall gait velocity (42.7 vs. 23.6 cm/s).

Conclusion: We present a dynamic approach for gait analysis in mice, which allows the study of the effects of fracture, fracture stabilization,

and fracture healing as well as the analysis of different fraction fixation techniques. Femur fractures stabilized by common pins showed a reduction of the maximum tibio-femoral angle, the stride length and the overall gait velocity.

References:

Disclosure: No significant relationships.

M053 Effect of Number and Location of Distal Locking Screw on Rotational Stability of a Femoral Nail: a Navigation Measurement

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Introduction: Single distal locking screw insertion had been accepted as an option in clinical practice of femoral nailing. However, effect of number and location of the screw on rotational stability of the construct was still doubtful. Therefore, this experimental study was conducted to compare rotational stability of the femoral nail construct among three different conditions (two distal screws, single distal screw in different locations).

Materials and Methods: Eight right femoral sawbones were selected for this study. Each of which was implanted with GK femoral interlocking nail (11 × 400 mm) and a static proximal locking screw follow by single distal screw insertion in the most distal screw hole. Then, transverse osteotomy was performed at the mid-shaft to simulate simple fracture. After the femur was stabilized on the custom holding jig, rotational force was applied to the femoral condyle by using a torque wrench connecting to the distal part of the jig starting from 2 to 8 Nm in 2 Nm increment. Total rotational angle in each situation was measured by modification of navigation system. Thereafter, testing protocol was repeated to the same specimen but two distal locking screws and single distal locking screw in the most proximal screw hole, sequentially. Different angle in each testing condition was compared among the different constructs by using paired t-test.

Results: Rotational stability was significantly better in the group of two distal locking screws in every testing condition ($p < 0.05$). Single distal screw in the most proximal screw hole provided more rotational stability than that in the distal screw hole at 8 Nm ($p = 0.003$).

Conclusion: This study demonstrated that two distal locking screws provide more rotational stability than single screw in the case of simple mid-shaft femoral fracture stabilized with interlocking nail. If single distal screw was considered, insertion in the most proximal hole would be a better option in term of rotational stability than that in the most distal hole. **Disclosure:** No significant relationships.

M054 A Biomechanical Comparison of a Biodegradable Volar Locked Plate with Two Titanium Volar Locked Plates in a Distal Radius Fracture Model

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Introduction: Van Manen et al. presented a clinical trial of volar or dorsal bioresorbable plates versus volar or dorsal metal plates for the ORIF of distal radius fractures at the ESTES-Meeting 2007. The main complication in the bioresorbable group was mechanical failure so that the study was terminated ahead of schedule. With the bioresorbable plates used in that study, angular stability was provided by spot-welding the screw heads to the plate with a cautery pen. One question in the present study was if bioresorbable implants that achieve angular stability by the screw thread cutting into the plate can provide mechanical properties that are comparable with standard titanium-implants. The other goal of this study was to evaluate the biomechanical properties of a newest generation anatomical shaped implants.

Materials and Methods: Three implants were tested in this study. The Inion OTPSTM Biodegradable Distal Radius Plate that is made of L-PLA/D, L-PLA and TMC, the titanium 2.4-mm LCP Volar Column Distal Radius Plate and the 2.4/2.7-mm volar Distal Radius Plate. Twelve pairs of fresh-frozen radii were assigned to three BMD-matched groups. A extra-articular distal radius fracture was created. Post-plating stiffness and displacement were studied in a first axial-loading test. Next, biodegradation was simulated by 4 weeks' immersion in PBS, followed by a second axial test. Finally the specimens underwent cyclic loading.

Results: Initial test: The LCP plate was significantly stiffer and displaced less than the bioresorbable plate. Post immersion tests: One bioresorbable plate failed early on after 4 weeks' immersion. The remaining bioresorbable plates and the T-plates did not differ significantly. Cyclic tests: The LCP plate was significantly superior to the other systems. One T-plate and four of the bioresorbable plates failed; none of the LCP plates did. In the bioresorbable constructs, stability, time to failure, and BMD were significantly correlated.

Conclusion: Except one plate failure the bioresorbable plate was similar to the T-plate in the quasi-static tests, and should, therefore, be considered for clinical studies, with patient selection confined, initially, only to candidates with good bone stock quality.

Disclosure: No significant relationships.

M055 Biomechanical Evaluation of the Calcaneal Fixation of a Retrograde Intramedullary Nail for Tibiototalcalcaneal Arthrodesis. The Potential of Cement Augmentation

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Introduction: Retrograde intramedullary nailing is an established technique for tibiototalcalcaneal arthrodesis (TTCA). Sound fixation in the hindfoot remains a problem in poor bone stock (osteoporosis, neuroarthropathy). So bone-cement augmented fixation of the nail in the calcaneus could be useful.

Materials and Methods: In seven pairs of human below-knee specimens, bone mineral density (BMD) was determined, and TTCA was performed with an intramedullary nail (Synthes Expert HAN), using a perforated screw plus a fixed-angle perforated screw vs a conventional screw plus a conventional fixed-angle screw, in the calcaneus. After that augmenta-

tion was performed through the perforated and canulated screws using 3.5 ml PMMA cement. The constructs were subjected to quasi-static loading (dorsiflexion/plantar flexion, varus/valgus, rotation) and to cyclic loading to failure. Parameters studied were construct neutral zone (NZ) and range of motion (ROM), and number of cycles to failure.

Results: The augmented screw constructs had a significantly smaller NZ and ROM in the quasi-static test and in the cyclic test. Furthermore failure occurred significant later in the augmented group. There was a significant correlation between BMD and cycles to failure.

Conclusion: In TTCA with a Nailing System, the use of bone-cement-augmentation - techniques can further reduce motion within the construct. This may be especially useful in poor bone stock. So results obtained in this study could be used to give the operating surgeon's further options in TTCA in severe cases.

Disclosure: No significant relationships.

M056 The Quality of the Bone Cement Application Depends on the Chemical Composition of the Application System

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Introduction: The exothermal reaction of PMMA leads to an extensive interaction between the bone cement and the plastics of the application system. This chemical reaction changes the structure of the bone cement and especially makes air pockets. It is necessary to develop application systems with a special composition of the plastics so that there is no interaction between the cement and the application system. In this study a new application system is presented for the first time which does not interact with the bone cement.

Materials and Methods: Two different application systems for bone cement were tested in this study. One popular and frequently used system made of polyethylene and a new system made of polypropylene. A special testing unit, in which the application systems were mounted, was used. The testing unit worked with a certain pressure so that a defined amount of bone cement was injected. The resistance data and the time were digitally collected and statistically evaluated. In all 60 procedures were carried out. After the injection all application systems and the injected bone cement were microscopically analyzed.

Results: Two groups, old versus new application systems, were divided. Both groups showed significant differences. When using the old application systems made of polyethylene the time frame for injection of the cement was 4 min while the time frame with new system made of polypropylene was 10 min. Microscopically there is a significant interaction between the plastics and the cement in the old systems with massive air pockets. In contrast there is no interaction, no air pockets and a homogeneous pattern of the cement when using the new systems.

Conclusion: The new application system made of polypropylene showed a significant longer time frame for application of the cement as well as no interaction with the plastics. It is possible to treat more than one localization with one application system which makes it financially rewarding. Additionally there are no air pockets reducing the danger of infection and increasing the structural stability of the bone cement.

Disclosure: No significant relationships.

HIP

M057 Co-morbidity and Age: Predictors of Functional Outcome Following Femoral Neck Fractures Treated with an Arthroplasty. Limitations of the Harris Hip Score

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Introduction: Femoral neck fractures are common fractures. Despite the frequency of this fracture and the consequences associated with it, little is known about the functional changes that can be expected during and after rehabilitation. The aim of this study was to identify prognostic factors for functional outcome, using a modified Harris Hip Score, after a femoral neck fracture treated with an arthroplasty.

Materials and Methods: We included 252 patients who sustained a displaced femoral neck fracture treated with an arthroplasty. Functional outcome after surgery was assessed using a modified Harris Hip Score, and was evaluated after 1 (HHS1) and 5 (HHS5) years. We analyzed the following prognostic factors for functional outcome of patients after treatment of femoral neck fractures with an arthroplasty: age, pre-operative co-morbidity, ASA-score, type of arthroplasty (hemi- or total hip replacement), surgeon experience (resident or attending surgeon), interval between trauma and operation, blood loss, direct (associated with the arthroplasty) peri- and post operative in-hospital complications related to the arthroplasty and general post operative in-hospital complications. To challenge the outcome of the analyses we used the Cronbach's alpha coefficients for testing the internal consistency.

Results: After one year the existence of co-morbidities (≥ 1) was a significant predictor for a poor functional outcome. With and without co-morbidities the mean HHS1 was 71.8 and 80.6, respectively. After 5 years all potential prognostic factors did not have significant influence on the functional outcome. To further analyse this outcome, internal consistency of the HHS was assessed. When pain and function of the HHS were analysed together the internal consistency was poor (HHS 1: 0.38 and HHS 5: 0.20). The internal consistency of the Harris Hip Score solely in function (without pain) improved to 0.68 (HHS1) and 0.46 (HHS5). When the potential prognostic factors were analysed with only the functional aspect, age and the existence of co-morbidities could be defined as a predictors for the functional outcome of femoral neck fractures after 1 and 5 years (r^2 24 and 19% resp).

Conclusion: Pain has such a dominant position in the Harris Hip Score that even immobile patients without pain can obtain a reasonable HHS score. The HHS, with the omission of pain, is therefore a more reliable score to estimate the functional outcome. After using the HHS in this modification, age and the existence of pre-operative co-morbidities appeared to be predictors of the functional outcome after 1 and 5 years.

References:

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Disclosure: No significant relationships.

M058 An Audit of Hip Fracture Admissions to a Hospital in the Northwest of England. How Well are we Doing?

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Introduction: Hip fracture is a common reason for morbidity and mortality. In the UK last year 68,284 patients were admitted with hip fracture, accounting for over one million bed days. Guidelines suggest that hip fractures should be treated surgically within 24 h of admission. Stockport NHS Foundation Trust in the Northwest of England treats approximately 350 hip fractures per annum.

Our primary aim was to audit the path of hip fractures from admission to discharge. We looked specifically at time taken to transfer to an orthopaedic ward, time to theatre, reasons for delay and time to discharge.

Materials and Methods: Using a proforma we collected data prospectively on hip fractures treated at Stepping Hill hospital between 01/01/08 and 01/07/09. Our inclusion criterion was hip fractures in patients over 65. Our exclusion criteria included subtrochanteric/pathological fractures, and fractures recently treated unsuccessfully. Data collected included patient demographics, fracture details, admitted from location, ASA grade, operative details, date/time of admission, date/time of surgery, reasons for delay to theatre, discharge date/location.

Results: We found that 487 hip fractures were treated in our trust. Of these, 76% were female. 64% were ASA grade 3 and 19% ASA grade 4. The mean age of our cohort was 83 years. 42% of hip fractures were intertrochanteric, 58% were intracapsular. The mean time to theatre was 46 h. 41% were treated within 24 h of admission and 73% were treated surgically within 48 h of admission. Reasons for delay included: patient medically unfit (51%); administrative reasons (41%) and other reasons (8%). The average length of hospital stay was 21 days (range 8–73).

Conclusion: Many studies have shown that delay to theatre beyond 48 h has an associated increased risk of morbidity and mortality in this cohort. Our data revealed that there is certainly room for improvement regarding treated more patients within the 24 h guideline however, there will always be a group of patients whom medical input is required prior to surgical management. Lack of theatre time appears to be a significant administrative reason for delay. This is an area of potential improvement however it must be noted that any system of this nature will carry an intrinsic delay in processing.

References:

Primary diagnosis: Hospital Episode Statistics publication. available from www.hesonline.nhs.uk

Prevention and management of hip fracture in older people: Scottish Intercollegiate Guidelines Network publication. Available from www.sign.ac.uk

Bottle A, Aylin P. Mortality associated with delay in operation after hip fracture: observational study. *BMJ* 2006;332(7547):947–51.

Lefavre KA, Macadam SA, Davidson DJ, Gandhi R, Chan H, Broekhuysen HM. Length of stay, mortality, morbidity and delay to surgery in hip fractures. *J Bone Joint Surg Br.* 2009;91(7):922–7

Disclosure: No significant relationships.

M059 The Influence of Surgeon Volume on Fixation of Femoral Neck Fractures

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Introduction: Displaced femoral neck fractures lead to unacceptably frequent loss of reduction and avascular necrosis after fixation. We hypothesized that high volume surgeons show better results than low volume surgeons.

Materials and Methods: We performed a retrospective cohort study between 2004 and 2007, 802 patients with a proximal femoral fracture were treated. A subgroup of 125 patients was analysed after internal fixation of a femoral neck fracture (42 Dynamic Hip Screw (DHS), 83 cannulated screws). X-rays and post-op data were analyzed on displacement, postoperative reduction, loss of reduction, and avascular necrosis (AVN) and revision rates. High volume surgeons were defined as surgeons who performed > 10 fixation procedures for proximal femoral fractures annually.

Results: Mean age (72 vs. 70 years) and percentage of fracture displacement (55 vs. 58%) were equal in both groups. Re-operations following loss of reduction or infection was seen in 21 (17%) patients. Less frequent complications were AVN (8%), coxarthrosis (2%) and pain due to screws bulging out (6%) led to a total conversion rate to arthroplasty in 33%. Displaced fractures show a higher rate in loss of reduction (27%, $p < 0.05$) and revision (40%, $p = 0.05$) than non-displaced fractures (3.7%; 20.4%). Patients > 70 years showed 19% loss of reduction, 14% AVN and taking the reoperations due to coxarthrosis and pain into account, a total revision rate of 40% was seen compared to 16, 5, and 29% in younger patients. Radiological analyses revealed that the lack of medial support lead to revisions in 52% of the cases, dorsal angulation in 50%. Low volume surgeons did not perform worse than high volume surgeons. The latter group showed 19% loss of reduction, 14% AVN and total revision rate 40%, compared to 16, 5 and 29% in the low volume group. We found no differences in the outcome of treating displaced fractures.

Conclusion: The outcome of fixation of femoral neck fractures is poor. Especially displaced fractures, inadequate fracture reduction and high age were associated with poor outcome. Therefore, arthroplasty should be considered in patients older than 70 years with displaced fractures that cannot be reduced anatomically. We could not demonstrate that high volume surgeons performed better

in this group but we are convinced that further specialization of care is mandatory to improve results of this unsolved fracture.

References: Browne, J.A., R. Pietrobon, and S.A. Olson, Hip fracture outcomes: does surgeon or hospital volume really matter? *J Trauma*, 2009. 66(3): p. 809-14. Estrada, L.S., et al., Fixation failure in femoral neck fractures. *Clin Orthop Relat Res*, 2002(399): p. 110-8.

Disclosure: No significant relationships.

M060 A New Locking Plate and Dynamic Screw System for Internal Fixation of Intracapsular Hip Fractures; Results for the First 200 Patients Treated

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Introduction: The Targon Femoral Neck Hip Screw has been designed to improve the fixation of intracapsular hip fractures. Fracture healing complications after internal fixation occur in approximately 30-40% of displaced fractures and 5-10% of undisplaced fractures.

Material and Methods: The new implant consists of a small plate with six locking screw ports. The two distal holes are used to fix the plate to the lateral cortex of the femur. Three of four screws are passes through the proximal holes and across the fracture site. These 6.5 mm screws are dynamic to allow for collapse of the fracture across the femoral neck. A jig is used to aid insertion of the device with minimal surgical exposure of the femur.

Results: For the first 200 patients treated with this implant at the first centre to use this implant, the mean age of the patients was 77 years (range 39-103), 58% were female. The mean length of surgery was 46 minutes and the mean length of anaesthesia 59 minutes. The median length of institutional stay till discharge home was 9 days (mean 13 days, range 3-107). Four telescoping screws were used in 55% of patients, three in 44% and two in 1% of patients. Follow-up of patients at present is a minimum of six months. For the 74 undisplaced fractures there has been one case of non-union and one case of avascular necrosis. For the 121 displaced fractures (Garden III and IV) there have been eleven cases of fracture non-union, six cases of avascular necrosis and two cases of plate detachment from the femur treated by repeat fixation. In addition there was one deep wound sepsis treated by removal of the implant and girdlestone arthroplasty. For the five basal fractures treated there has been one case of plate detachment from the femur. Observation of those fractures that have healed shows there has been between 0 to 22 mm of collapse at the fracture site which occurs along the line of the femoral neck. There has been no tilting of the fracture into varus as occurs with a parallel screw method.

Conclusion: The results to date show an incidence of fracture healing complications is about a third that which is to be expected with a parallel screw method. This new implant may be a significant advance in the treatment of this difficult and common fracture.

Disclosure: The author has received honorarium from commercial companies for giving lectures on hip fracture treatment. In addition he has received royalties from B.Braun Ltd related to the design and development of an implant.

M061 Full Threaded Compression Screws Should not be used in Adult Femoral Neck Fractures

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Introduction: Purpose: To compare the functional and radiological outcome of femoral neck fractures fixed with closed reduction and two different cannulated titanium screws.

Material and Methods: Patients & Methods: The study was prospective, randomized and IRB approved. Inclusion criteria included skeletal maturity, closed femoral neck fracture without concomitant fractures or injuries with complete charts and adequate radiographs obtained from the initial injury till the last follow-up. Forty-four patients have been enrolled in our study during one-year period at two university centers. Of 44 patients who consented to participate in the study, 22 were randomized to be treated with full threaded, cannulated compression screws (Acutrak 6/7, ACUMED)(Group 1) and 22 with 16 mm threaded, 6.5 mm or 7.3 mm cannulated screws (SYNTHES) (Group 2). Three or four screws were used in both groups according to fracture type and surgeon's preferences. Data evaluated included surgical time, fluoroscopy time, fracture type, radiological outcome, complications and functional status by Harris Hip Score.

Results: Both groups were comparable in terms of age and gender. There was not a significant difference in terms of surgical time, follow-up period, fracture type, or fluoroscopy time. There were eight complications in Group 1 and two in Group 2, which was statistically significant ($p = 0,049$) Time to union was significantly longer in Group 1 ($p = 0,001$). However, Hip Scores were not significantly different in both groups ($p = 0,20$).

Conclusion: When compared with full threaded compression screws the 16 mm threaded screws provides a shorter union time and less complication rate while providing equivalent functional results in adult femoral neck fractures.

Disclosure: No significant relationships.

M062 Can the Outcome After Hemiprostheses of the Hip in Femoral Neck Fractures Significantly be Influenced by Choice of a Minimally Invasive Approach?

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Introduction: Depending on patient's age, risk factors and pretraumatic mobility, a total- or hemiarthroplasty of the hip have become the treatment of choice in femoral neck fractures(1-4). Internal fixation has shown to provide minor results. The majority of these patients are therefore treated by a hemiarthroplasty of the hip. Since the

primary goal is to regain the pretraumatic level of mobility as soon as possible(3;5), we sought to investigate, if a minimal invasive anterior approach would be beneficial in regard of perioperative blood loss(6), postoperative pain(7;8) and thus postoperative mobility(9).

Material and methods: In a randomised controlled trial, 48 patients were treated by a hemiarthroplasty of the hip via an anterior or lateral approach in supine position within 72 hours after trauma(10). Apart from parameters like age, ASA-Score or Body-mass-index, the main focus was set on perioperative blood loss, pain and postoperative mobilisation. All data collected were compared between groups to detect statistical significant differences. Additionally the same parameters were checked for significant differences comparing patients with or without complications within their group.

Results: A significant difference between groups was found for postoperative pain within the first 72 hours and for operation time, both to the disadvantage of the minimal invasive approach group. Within groups, time of operation and patient's age were significantly higher in patients with complications in the minimal invasive group such as pain at 48 hours was rated higher in patients with complications in the lateral approach group. These results though did not seem to influence postoperative mobility since no significant differences were found between groups at follow-up.

Conclusion: Despite some differences in the postoperative course, postoperative mobility does not seem to be greatly influenced by the choice of the approach for hemiarthroplasty of the hip in femoral neck fractures. Still, the operation time was significantly linked to postoperative complications. In this respect, it can be concluded, that the approach an individual surgeon is most familiar with is likely to lead to best results.

References: (1) Blomfeldt R, J Bone Joint Surg Br 2005 Apr;87(4):523-9. (2) Blomfeldt R, J Bone Joint Surg Br 2007 Feb;89(2):160-5. (3) Gjertsen JE, Acta Orthop 2008 Oct;79(5):594-601. (4) Rogmark C, Acta Orthop 2006 Jun;77(3):359-67. (5) Koval KJ, J Am Acad Orthop Surg 1994 May;2(3):141-9. (6) Bierbaum BE, J Bone Joint Surg Am 1999 Jan;81(1):2-10. (7) Foss NB, Br J Anaesth 2009 Jan;102(1):111-6. (8) Morrison RS, Pain 2003 Jun;103(3):303-11. (9) Rachbauer F, Oper Orthop Traumatol 2008 Sep;20(3):239-51. (10) Smeckala R, BMC Musculoskelet Disord 2008;9:171.

Disclosure: No significant relationships.

M063 A Provincial Integrated Model to Improve Care for Patients Following Hip Fracture

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Introduction: Fractures of the proximal femur are increasing in incidence as the population ages. In order to address this problem the Province of Ontario, Canada (population 14 million) has advocated an integrated model of care.

Material and Methods: A policy to improve the outcome for patients sustaining hip fractures has been developed. It has been implemented in the 14 health regions of the province. The objectives are: 1) All surgical procedures to be performed within 48 hours of patient's

admission to hospital. 2) Surgical treatment of hip fractures must permit unrestricted weight bearing. 3) A structured acute care post-operative course followed by admission to progressive rehabilitation.

Results: Since the implementation of this policy 90% of all hip fracture patients are receiving definitive surgical treatment within 48 hours of admission. Site variations are identified and remedial actions implemented for those hospitals which fail to meet this target. Acute care length of stay following hip fracture has declined from a mean of 17 days to a mean of 8 days. The number of patients with hip fractures returning to their pre-injury residence has increased significantly from approximately 35% to 70% at 3 months post-fracture.

Conclusion: A structured program for hip fracture care can be developed in large population areas and has been implemented for the approximate 10,000 patients sustaining hip fractures annually within our jurisdiction. This model should be broadly applicable to other health regions.

Disclosure: No significant relationships.

M064 An Audit of Antiresorptive Therapy Following Hip Fracture Admission to a Hospital in the Northwest of England

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Introduction: In the UK last year there were 68,284 hip fractures admitted and treated to the NHS. The majority of these were fragility fractures following a fall at home. Guidelines suggest that all hip fractures admitted should receive an assessment to determine the need for antiresorptive therapy aimed to reduce the risk of future osteoporotic fractures.

Our primary aim was to audit the assessment for antiresorptive therapy on admission for hip fractures treated at Stockport NHS Foundation Trust. The dedicated hip fracture trauma unit, The Ratcliffe Unit, is the centre for the management of hip fractures admitted to Stepping Hill hospital.

Material and Methods: Using a proforma we collected data prospectively on all hip fractures admitted to Stepping Hill hospital. We gathered information on patient demographics, fracture details, location admitted from, operative details, and antiresorptive therapy assessment during this episode.

Our inclusion criterion was all hip fractures admitted to Stepping Hill hospital between 1st January 2008 and 1st July 2009. Our exclusion criteria included pathological fractures and fractures in patients aged younger than 65 years old.

Results: During our study period 512 hip fractures were admitted. Of these, 75.3% were female. The mean age was 83 years. Of the fractures treated, 39.4% were intertrochanteric, 54.9% intracapsular (77.8% displaced) and 5.7% were subtrochanteric fractures. 13% were ASA grade 1-2, 64% were ASA grade 3 and 19% ASA grade 4. 72.7% of patients were admitted from their own home or sheltered housing and 22.9% were admitted from a nursing home or residential care.

Of the 512 patients, 350 (68.3%) received a formal assessment for antiresorptive therapy. The outcomes of this assessment is as follows: 4.6% did not require any antiresorptive therapy, 0.9% awaiting bone clinic assessment on discharge, 5.4% awaiting a DEXA scan, 73.7% of patients were started on antiresorptive therapy and 14% were continued on antiresorptive therapy from pre-admission.

Conclusion: Our study highlighted that in our trust only 68.3% received this assessment formally. We can conclude that when this assessment occurs the guidelines and hence subsequent fragility fracture secondary prevention is addressed.

We have then presented this data locally and amended our integrated neck of femur documentation pathway to include a section on anti-resorptive therapy assessment. To follow this up we plan to re-audit from 1st January 2010 to 1st January 2011.

References: The Blue Book: The care of patients with fragility fracture. British Orthopaedic Association publication. September 2007.

Primary Diagnosis: Hospital Episode Statistics 2008. Available from www.hesonline.org.uk

Port L, Center J, Briffa NK, Nguyen T, Cumming R, Eisman J. Osteoporotic fracture: missed opportunity for intervention. (2003). *Osteoporos Int.* 14(9):780-4

Disclosure: No significant relationships.

SPINE

M065 Two-Year Results of Intraoperative 3D-based Navigation at Interventions of the Cervical and Thoracic Spine. What is the Benefit, What are the Problems?

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Introduction: In recent years, navigated surgical procedures in spinal surgery have been established due to an increasing demand for precision. Especially 3D-C-arms connected with navigation systems are being used more often and can be utilized intraoperatively for planning as well as controlling of screw positions. This study analyses our experiences with 3D-based navigation in the posterior cervical and high thoracic spine.

Material and Methods: A 3D-C-Arm (Vision Vario 3D, Ziehm) was connected with a navigation system (Vector vision, Brainlab) and since 10/2007 used for the placement of overall 350 Screws at 51 Patients. Of those 9 Patients had to undergo operations in the posterior cervical spine, of 53 screws Judet- (n = 8), Massa lateralis- (n = 27) and pedicle-screws (n = 18) were placed. Indications for instrumentation were traumatic fractures (n = 3), spondylodiscitis (n = 1), multiple metastases with high-grade instability (n = 4), and degenerative rheumatic stenosis of the spinal canal (n = 1). Concerning the high thoracic spine (T1-10) 42 interventions were made with the method, 297 pedicle-screws were implanted. Indications in this area were traumatic fractures (n = 24), metastases (n = 14) and spondylodiscites (n = 4).

Results: Scan-time intraoperatively took 60 seconds on average, data-transfer to the navigation-system another 10 seconds. Application-time including anti-collision-check needs approx. 6 minutes [5;18]. In total 260/350 (74%) screws could be inserted assisted with navigation, 194/350 (55%) were controlled intraoperatively. Regarding the cervical spine in 44/53 (89%) of the screws the navigation procedure was uneventful. Positioning of 37/53 (70%) of the screws was checked

immediately postoperatively. In the upper thoracic spine 216/297 (73%) could be placed with navigation, 157/297 (53%) were controlled intraoperatively. Occasionally, scan-setup was problematic, in addition, we experienced technical problems. Correct placement was seen for each screw, thus correlating well with the intraoperative findings.

Conclusion: The application of the combination of intraoperative 3D-imaging and navigation for posterior instrumentation of the cervical and the upper thoracic spine is technically feasible and reliable in clinical use. User- and software-dependant sources of error could be solved during the first course of the series. Image-quality at the cervical spine is depending on individual bone density, and possible metal artifacts. With undisturbed visibility of the vertebral body, the reliability of 3D-based navigation at the cervical spine is comparable to that of CT-based procedures. Additionally, it has the advantage of skipping preoperative acquisition of data as well as the matching-process. Furthermore, exposure to radiation is reduced due to the possibility of sparing pre- and postoperative CT.

Disclosure: No significant relationships.

M066 Sufficiency of Isolated Dorsal Instrumentation for Fractures of the Thoracolumbar Spine

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Introduction: The isolated dorsal instrumentation is the standard therapy for stable fractures of the spine. In a retrospective evaluation of our own patients we analysed the indication to borders and results of the isolated dorsal instrumented fractures of thoracolumbar spine.

Material and Methods: From 2004 to 2007 72 patients were treated by isolated dorsal instrumentation of fractures of the thoracolumbar spine in our clinic. In a retrospective examination subjective results by means of VAS, Oswestry Score (OS) and Hannover Spine Score (HWS) and a radiological analysis were grasped with the patients beside the clinical investigation before and in a 2 years follow up after surgery.

Results: All together 72 patients could be enclosed, from which 56 took part in a follow up examination. The average age at the accident time lay in the Median with 59 Years (17/77) by a gender distribution of 22 men to 34 women. By the fracture distribution appeared excluding A injuries. These divided in 19 A1, one A2, and 36 A3 fractures. With 12 fractures the dorsal cortex of the vertebra was fractured. Depending on Fracture type a bisegmental dorsal instrumentation occurred in 21 cases and monosegmental in 34 cases. With the clinical 2-years follow up a finger ground distance of 18 cm (0/52) appeared in the Median. One patient showed a neurological deficit. The standardised measuring values showed in the Median for Ott 31 (31/33) and Schober 13 (11/15) norm-valued measuring values. The VAS appeared with 1 in the Median (0/8) and 23% of the patients showed a VAS > 5. Rest pains appeared with 6, load pains with 24 and night pain with 10 patients. The OS appeared at a range of 6 (0/64), the HWS at 78 (0/100). With regard to the analysis of the fracture height a clear trend with an increased pain situation and lower subjective patient's satisfaction appeared for fractures of the LWK II and III, without a significance level was reached. As another factor the secondary lost of reposition could be identified for a worse Outcome. In 5 patients with an VAS > 5 we saw a

decrease of the vertebral height of 10% and more in comparison to the postsurgical X-ray results.

Conclusion: The isolated dorsal instrumentation of Typ A fractures of the spine showed good clinical results if the surgically achieved restoration of the vertebral height could be held. The unstable fractures show the border for the isolated dorsal instrumentation. In spite of exact knowledge and the analysis of the fracture type it can come to poor results, so that the decision remains an individual isolated case decision.

Disclosure: No significant relationships.

M067 Long Term Results of Posterior Surgery for Thoracolumbar Fractures: Sagittal Plane Analysis

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Introduction: The early and long-term changes in the sagittal plane of Thoracolumbar (TL) vertebra fractures which received posterior instrumentation were examined.

Material and Methods: Between the years 1998-2004 15 patients (11 male, 4 female) were operated on for TL. The average age was 34.6 (16-57). Posterior pedicle screws with fixation rods were applied with distraction and fusion to all patients. Sagittal plane measurements were taken radiologically preop (Group 1), early postop (Group 2) and late postop (Group 3). Fractured vertebra local kyphos angle (LKA), anterior compression angle (ACA) and posterior (E) and anterior (F) height were measured and compared. Visual analog scale (VAS) were evaluated. The average follow up period was 8.43 (5-11) years.

Results: Significant differences between the averages of LKA, ACA, E/F scores of Group 1, Group 2 and Group 3 were found ($p < 0.001$). The average LKA measurements in order were: 12.63°, 0.21°, 6.92° ($p < 0.001$), and for ACA: 14.13°, 5.83°, 6.25° ($p < 0.001$). While a significant difference between the averages of LKA, E/F of Group 2 and Group 3 ($p < 0.05$), no statistical difference was found comparing the average ACA angle ($p = 0.753$). While there was no significant change in E for all groups ($p > 0.05$), the increase in F after surgery was considered significant ($p < 0.05$), and no difference was observed between the averages of Group 2 and Group 3 ($p > 0.05$). VAS was 2.73 (0-5).

Conclusion: At the end of an average 8 year follow up period of posterior TL fractures no difference was found between the early and late period measurements of ACA and anterior height. Although LKA showed a statistical loss in height the correction degree achieved in the late period was found to be significantly higher than preop.

References: 1. Altay M, Ozkurt B, Aktekin CN, Ozturk AM, Dogan O, Tabak A.Y. Treatment of unstable thoracolumbar junction burst fractures with short- or long-segment posterior fixation in magerl type a fractures

2. Alanay A, Acaroglu E, Yazici M, Oznur A, Surat A. Short-segment pedicle instrumentation of thoracolumbar burst fractures: does transpedicular intracorporeal grafting prevent early failure? Spine. 2001 Jan 15; 26(2): 213-7.45.

3. Boerger TO, Limb D, Dickson RA. Does 'canal clearance' affect neurological outcome after thoracolumbar burst fractures? J Bone Joint Surg Br. 2000 Jul; 82(5): 629-35. Review.

4. Parker JW, Lane JR, Karaikovic EE, Gaines RW. Successful short-segment instrumentation and fusion for thoracolumbar spine fractures: a consecutive 41/2-year series. *Spine*. 2000 May 1; 25(9): 1157-70. Review.

5. Magerl F, Aebi M, Gertzbein SD, Harms J, Nazarian S. A comprehensive classification of thoracic and lumbar injuries. *Eur Spine J*. 1994; 3(4): 184-201.

Disclosure: No significant relationships.

M068 A Comparison of Radiological and Functional Results After Operative Treatment of Thoracic and Lumbal Spine Fractures in Older Patients

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Introduction: According to literature there is no algorithm of treatment for clinical everyday use for older patients with operation-worthy compression fractures of the thoracic and lumbal spine in regard of the functional and radiological outcome. The aim of our investigation was to reach an special algorithm of treatment for clinical everyday use in regard of the special difficulties for these patients.

Material and Methods: The following inclusion criteria were fixed: 1. Minimum age 65 years, 2. presentation of a compression fracture (Type A3 to AO Magerl), 3. adequate accident mechanism. 41 patients fulfilled the inclusion criteria from 01/2002 to 12/2005. These were assigned in 3 groups depending on the technique used: combined dorso-ventral stabilization, posterior instrumentation with internal fixator only and ballon-kyphoplasty. General demographic and epidemiological data as well as the therapy course were collected. Radiological evaluations were used as a measure for the reduction and correction as well as the outcome. In addition, a follow-up of the patients with valuation of the subjective and functional healing was assessed. The decision for one of the 3 methods was made by judging the general medical condition and the OP risk linked with it and the extent of the burst component of the fracture in the CT-Scan.

Results: The combined dorso-ventral group (18) showed the youngest age in average (67 years), in both other groups (internal fixator only 7 patients; Ballonkyphoplasty 16 patients) the mean age was the same (75 years). OP duration, intraoperative blood loss, stay during the hospital were the longest or the highest in the combined dorso-ventral supplied patients. The highest general complication rate (28%) also appeared in this group. Follow-up was done on average after 39 months, Re-examination rate was 78%. The combined treated patients showed the best functional and radiological outcome. Bone fusion occurred in 86%. The patients, who underwent only dorsal instrumentation showed the worst functional and radiological outcome of all groups.

The patients treated with kyphoplasty showed only a slightly less favorable functional result than the combined treated patients.

Conclusion: The results support the following algorithm of treatment in our department: Good general condition with high activity level before accident: combined dorsoventral fusion. Poor medical condition, low activity with relevant burst component posterior instrumentation only. Poor medical condition, low activity level, no relevant burst component: Kyphoplasty. In regard of the worse

functional outcome of posterior fusion only, cement augmentation of the pedical screws and minimal invasive techniques may lead to better results for these patients.

Disclosure: No significant relationships.

M069 Segmental Spine Instrumentation in Thoracolumbar and Lumbar Fractures. A 12-Year Experience

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Introduction: Thoracolumbar and lumbar fractures are serious lesions associated commonly with neurological deficits. Posterior stabilization by internal fixation is actually a frequent procedure for the treatment of unstable fractures. The objective of this study is to retrospectively analyze the functional outcome of segmental spine instrumentation of unstable thoracolumbar and lumbar fractures, and the association with neurological impairment(1).

Material and methods: This retrospective study included 70 patients (49 men and 21 female) with acute unstable thoracolumbar and lumbar fractures, between January 1996 and December 2007 treated with segmental instrumentation (61 with transpedicular fixation and 9 sublamina wiring fixation). The medium age was 38,22 years (15-70 years) and the medium time of follow up was 75,60 months (20-150 months). The fractures were in 14 cases D12, 26 L1 and 30 in other locations. The evaluation included location, mechanism and type of fractures; associated injuries, neurological symptoms pre and post surgery, complications and radiograph evaluation of the degree of reduction. The injuries were evaluated with the Thoraco-Lumbar Injury Classification and Severity Score (TLICS) and the patients with the Oswestry Disability Index (ODI) and visual pain analogical scale(2).

Results: The lesion in 71,4% resulted from a fall from height, in 20% a car accident and another cause in 8,6%. In 56 cases 1 vertebra was affected, in 12 two vertebrae and in 2 multi-level injuries. The angle of kyphosis was on average 22.1°. Vertebral body was completely restored in 48 cases and incompletely in 22 (up to 5° deficit). TLICS was 5 in 25,7%, 6 in 21,4%, 7 in 11,4%, 8 in 11,4% and 9 in 8,6%. 55,7% of the patients had no neurologic lesions; 7,1% nerve root, 14,3% incomplete and 20% complete cord lesion and 2,9% with cauda equina. 71,4% returned to work: 57,1% to the same and 14,3% to a lighter job; and the rest didn't work at all. According to the ODI 36 patients had 20-40%, 7 > 40-60% and 6 > 80%.

Conclusion: Work status correlated directly with neurological impairment but not to injury level or mechanism. Although the important trauma experienced by these patients, return to work and results in the ODI were good. The group with complete neurological lesion had elevated disability scores associated with functional impairment. With adequate and early treatment of spine fractures we can prevent further neurological deficits(3).

References: 1. Biomechanical comparison of instrumentation techniques in treatment of thoracolumbar burst fractures. *Orthop Sci*. 2009 Jul;14(4):443-9 2. Krbec M., Stulik J. Treatment of thoracolumbar spinal fractures using internal fixators. *Acta Chir Orthop Traumatol Cech* 2001;68(2):77-84 3. Reinhold M., Knop C. Operative

treatment of traumatic fractures of the thorax and lumbar spine. Unfallchirurg. 2009 Feb;112(2):149-67

Disclosure: No significant relationships.

M070 Comparing Posterior and Anterior/Posterior Surgery in Thoracolumbar Vertebra Fractures

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Introduction: Surgical treatment for fractures in the Thoracolumbar (TL) region are controversial. Mid term functional and radiological results of the sagittal plane of posterior surgery (group 1) and anterior surgery (alone or combined) were compared.

Material and methods: Between the years 1998-2005 20 patients (7 female, 13 male) were operated on for TL vertebra fractures. (15 posterior, 3 anterior, 2 anterior + posterior). The average age of Group 1 was 34.6 ± 15.06 , and Group 2 was 35.4 ± 11.13 . Fractures were classified according to the AO/Magerl system, and the neurological status was evaluated with Frankel and ASIA. Local kyphos angle (LKA), anterior compression angle (ACA), anterior height (F) were measured radiologically on the sagittal plane and compared postoperatively in the early and late term. Patient satisfaction was evaluated using visual analog score (VAS). Patients were evaluated for implant failure, infection and neurological status. The average follow up period was 8.43 ± 2.99 years for Group 1, and 8.9 ± 0.22 years for Group 2.

Results: Of 20 patients a total of 31 vertebra were diagnosed with fractures. 27 fractures were type A, 2 type B, and 2 type C (between T5-L4; the most effected vertebra was L1). The average LKA for all groups preop, early and late term results were measured. Group 1: $12.6, 0.21, 6.9^\circ$ ($p < 0.001$). Group 2: $26.6, 21, 21^\circ$ ($p > 0.05$). The average ACA measurements were Group 1: $14.1, 5.83, 6.25^\circ$ ($p < 0.001$). Group 2: $17.6, 13.63, 9.5^\circ$ ($p > 0.05$). The average F values were Group 1: $2.4, 2.87, 2.83$ cm ($p < 0.001$). Group 2: $1.83, 2.13, 2.03$ cm ($p > 0.05$). There were no neurological complications and infections. Implant failure was only detected in Group 1 (70%). Group 1 average VAS was higher than Group 2 ($p < 0.05$).

Conclusion: When comparing Group 1 with Group 2, Group 1 showed a significant correction on the sagittal plane but satisfaction was higher in Group 2. For TL fractures that receive Group 2 the risk of implant failure is lower and satisfaction is higher.

References: 1. Modi HN, Chung KJ, Seo IW, Yoon HS, Hwang JH, Kim HK, Noh KC, Yoo JH. Two levels above and one level below pedicle screw fixation for the treatment of unstable thoracolumbar fracture with partial or intact neurology. Journal of Orthopaedic Surgery and Research 2009, 4:28.

2. Butt MF, Farooq M, Mir B, Dhar AS, Hussain A, Mumtaz M: Management of unstable thoracolumbar spinal injuries by short segment pinal fixation. International Orthop 2007, 31:259-264.

3. Altay M, Ozkurt B, Aktekin CN, Ozturk AM, Dogan O, Tabak AY: Treatment of unstable thoracolumbar junction burst fractures with short- or long- segment posterior fixation in magrel type a fractures. Eur Spine J 2007, 16:1145-1155.

4. Bohlman HH, Kirkpatrick JS, Delamater RB, Leventhal M. Anterior decompression for late pain and paralysis after fractures of the thoracolumbar spine. Clin Ortho and Related Res. 300 (1994), 24-9

Disclosure: No significant relationships.

M071 Fractures of the Fifth Lumbar Vertebra. Evaluation of 28 Cases in Years 1999-2007

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Introduction: Fractures of the fifth lumbar vertebra are extremely rare. In a world literature we can find only few papers about this problem. We would like to present the largest group of patients ever published, define the basic principles of treatment and describe typical complications.

Material and Methods: In the past 9 years (1999-2007) we have been treating 28 patients with this type of injury in our hospital. There were 21 men and 7 women in average age of 34 years. Surgery was performed by 23 patients, 5 patients were treated conservatively. All patients were regularly controled, we were evaluating radiological and neurological status, type and number of complications and patient satisfaction with the result of our treatment.

Results: By 13 patients we noted neurological deficit in the day of admission. By 8 patients the neurological status was completely normalised during the follow up period. By the others the neurological outcome was significantly improved. Average difference in high of frontal edge of vertebral body at the beginning and at the end of follow up period was 0.8 mm, difference in dorsal edge was 0.6 mm, difference in lordosis L4-S1 was 2.8 degrees and difference in angle of end plates of L5 vertebral body was 1.1 degrees. From early complications we once noted deep wound infection and once we had to reoperate because of L5 nerve root irritation. From late complications we once noted osteolytic rim around the screws and by 6 patients we noted breaking of transpedicular screw. At the end of follow up period 15 patients were painless, 10 patients were complaining about intermittent pain and 3 patients were complaining about frequently pain in the fracture site.

Conclusion: By patients with negative neurological status and minimal compression of vertebral body we strictly recommend conservative treatment. This method is preferable also by burst fractures without significant instability. The high of vertebral body and axis of the vertebral column would be influenced by operation just insignificantly. In the case of neurological deficit we would recommend operative treatment with decompression of neural structures. Practically always we could expect significant improvement of neurological status.

Disclosure: No significant relationships.

M072 Early Diagnosis of Concurrent Extraspinal Fractures Associated with Acute Spinal Cord Injury

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Introduction: Background:

- 1) Diagnosis of concurrent extraspinal fractures in acute spinal cord injured patients in trauma scenario may be difficult and overlooked in the absence of pain because of sensory impairment from neurological deficit.
- 2) Awareness of the frequency, location and related characteristics of these fractures is important for early effective evaluation, diagnosis and proper management of patients with acute spinal cord injuries.

Aims and Objectives:

- 1) To examine the frequency and related characteristics of concurrent extraspinal fractures amongst patients with a new onset of spinal cord injury.
- 2) To ascertain whether concurrent extraspinal fractures are identified within 24 hours of trauma.

Material and Methods: Retrospective case note and radiographic review using performa on all new onset spinal cord injured patients for a period of three years (Jan 2001- Dec 2003) admitted to North West Regional Spinal Injuries Centre.UK. Out of the total 189 patients admitted in three years 148 patients sustained injury due to trauma and were included in the study.

Results: 1) Out of the 148 trauma patients 32 patients had concurrent extraspinal fractures (21.6%).

2) In the first 24 hours after trauma 92.3% of extraspinal fractures were identified during primary survey while 7.7% of extraspinal fractures were diagnosed within 3 days of injury.

3) Falls were the leading cause of spinal cord injury and associated fractures(44.6%) followed by motor vehicle collision (37.8%) in North West Region of England.

4) The commonest anatomical regions with extra spinal fractures are the Upper extremity (35.7%) followed by Chest (32.1%).

5) Tetraplegic patients had more multiple extra spinal fractures compared to paraplegic patients. Paraplegic patients had more number of single extra spinal fractures.

6) The cause, level and extent of neurological deficit influenced the frequency and location of concurrent extra spinal fractures.

Conclusion: 1) All extraspinal fractures should be identified in primary survey and to avoid missing of these fractures a detailed secondary survey should be performed when the patient is shifted to the ward.

2) Tetraplegic patients had more multiple extra spinal fractures compared to paraplegic patients. Paraplegic patients had more number of single extra spinal fractures.

3) The cause, level and extent of neurological deficit influenced the frequency and location of concurrent extra spinal fractures.

4) The knowledge of frequency and characteristics of extraspinal fractures has to be disseminated among medical and nursing staff in accident and emergency department for early detection and treatment of these fractures.

References: 1) Epidemiology of extraspinal fractures associated with acute spinal cord injury: C-M Wang^{1,2}, Y Chen¹, M J DeVivo¹ and C-T Huang¹ Spinal Cord November 2001, Volume 39, Number 11, Pages 589-594

Disclosure: No significant relationships.

VASCULAR LESIONS

M073 High Energy Trauma of the Lower Limbs Complicated with Secondary Acute Peripheral Ischemia

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Introduction: High energy trauma are more frequent and their clinical aspects more complex, since diagnostic procedures can precisely identify the problem and clinical experience has significantly increased. Acute peripheral ischaemia appears immediately after trauma- these are cases when diagnostic is usually established without problems- or late after trauma, when the injury is usually post-traumatic arterial thrombosis (with late onset) or compression (by post-traumatic hematoma) with subsequent thrombosis.

Material and Methods: This retrospective study analyse 46 cases, operated between 01.01.2003-01.01.2009 with acute peripheral ischaemia following closed injuries of the inferior limbs. The structure based on age and sex of group revealed that most of the patients were active, underlying the social importance of the problem. The injuries were: femoral shaft fractures (4 cases), distal femoral fractures (8 cases), knee dislocations (8 cases), proximal tibial fractures (14 cases), tibial shaft fractures (8 cases), crushing without skeletal injuries (4 cases) In all these cases, pulse was present at the first evaluation, and the onset of acute post-traumatic ischaemia was at 8-49 hrs after trauma . The diagnosis, based on clinical suspicion, became definite after Doppler evaluation and arteriography. The anatomical base of ischaemia was late thrombosis (42 cases) and compressive hematoma (4 cases). Thrombosis was due to obstruction of the big arteries (39 cases) and microcirculation, due to overrrun compartment syndrome-3 cases. Vascular restoration and fasciotomy was performed whenever muscles were viable, but amputation was necessary in 3 cases

Results: The patients were analysed from the point of view of the correlation between the moment of onset of the ischaemia, the type of injury, the status of the muscular structures, the algorithm of diagnosis, the type of the treatment, and the clinical outcome. The study revealed that the clinical outcome was better when the time between trauma and ischaemia onset was less, since the muscular ischaemic had less time to develop. In the same time, there were 4 cases in which clinical symptoms were not corresponding to the imagistic evaluation.

Conclusion: High energy trauma affect all the structures of the limbs. Clinical suspicion has particular importance especially when trauma affects one of the regions which is known as establishing a dangerous environment between the arteries and the bones / joints. In all the cases that authors analyse, complete and early diagnosis and treatment of acute post-traumatic ischaemia, based on the close monitoring of the patient and " clinical alarm signs " seemd to be the conditions for the favourable outcome of the patients.

References: Schoder M. Acute peripheral arterial ischemia: diagnosis and interventional therapy. *Wien Med Wochenschr.* 2001;151(21-23):541-5

Disclosure: No significant relationships.

M074 Vascular Reconstruction in Posttraumatic Peripheral Ischemia

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Introduction: In vascular surgical practice the total of operations for treatment of traumatic lesions is rare with 0.3 to 4 %. Nevertheless there is a considerable risk of limb loss or death in complex trauma including vessel injuries. Immediate diagnosis and therapy are vital. Aim of this study was to analyze outcome in vascular surgical revascularization in extremity trauma.

Material and Methods: Between 1.1.2003 and 27.4.2009 a total of 61 vascular surgical operations were performed in trauma patients (pat). Prospectively collected data were analyzed retrospectively.

Results: In 7 pat. (7/61 = 11.5%) surgery was necessary for vascular lesions in the body trunk, in 12 pat (12/61 = 19.7%) in the head and neck area, in 20 pat (20/61 = 32.8%) in the upper extremity and in 22 pat (22/61 = 36.1%) in the lower extremity. Drei pat died 1-8 days postoperatively (mortality 3/61 = 4.9%). Reconstructions for trauma in the lower extremity were performed in 4 pat above the knee and in 16 pat in the genicular or infragenicular region. In 16 pat with distal vascular reconstruction there were 3 women and 13 men with a mean age 46.3 + 19.0 years (range 15 to 78 years). Reconstruction was due to penetrating trauma in 8 pat and in 8 after non-penetrating trauma because of ischemia of the distal extremity. A 39 y.o. man died on postoperative day 1 due to multi organ failure (mortality in lower extremity trauma 6.3% (1/16 pat)). In 4 pat a major amputation (1 exarticulation at knee level, 3 amputations above knee). In 2 pat amputation was performed early post revascularisation (day 5 and day 20 postop) and in 2 pat after an interval of 4 and 5 months because of deep infections with osteomyelitis. Limb salvage rate is 75% (12/16 extremities).

Conclusion: Optimal interdisciplinary cooperation and emergency revascularisation by an experienced vascular surgeon can help to prevent amputation in extremity trauma. Especially in polytraumatized patients the decision for or against vascular reconstruction is important the depending on the patients' condition and the extent of injuries.

Disclosure: No significant relationships.

M075 Simultaneous Surgical Treatment of Perineal Injury and Vascular Lesions of the Lower Extremity (Femoral Vessels)

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Introduction: The aim of presentation is to demonstrate the surgical treatment and postoperative period of a patient who was caught on a fence-pole and suffered severe injuries of perineal region and lower extremity.

Material and Methods: After a long time of technical rescue the patient arrived to our department with a one meter long portion of fence in his perineal region. After the urgent extraction of metal fence we performed an intraoperative rectoscopy. During the debridement and exploration of deep perineal injuries we realised a heavy swelling around the punctated wound of the left leg. We made a femoral incision and exploration and recognised the several injury of the femoral vein and artery. We provided the 4 cm long injuries with stitches.

Results: In the postoperative period we made a second-look and debridement because of lymphatic retention and small skin necrosis around the incision. No real vascular or circular lesions were recognised during the control period of the patient. Injuries were totally improved.

Conclusion: The edification of this case is that it's never sure that the major wound makes the bigger trouble to the patient or to the surgeon. In our presentation we plan to demonstrate the intra - and postoperative pictures and the results of controll period.

Disclosure: No significant relationships.

M076 Abdominal Vascular Injuries

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Introduction: To evaluate the results of the treatment of patients with abdominal vascular injuries.

Material and methods: Data on 42 patients with abdominal vascular injuries seen at a Vilnius University Emergency Hospital and Vilnius University Hospital were reviewed retrospectively.

Results: The incidence of various types of trauma were blunt in 13 patients (31%), gunshot wounds in 3 patients (7%), and stab wounds in 26 patients (62%). Only 15 (36%) patients were hemodynamically stable. Isolated abdominal vascular trauma was detected in 9 patients (21%). Vessels injured included aorta 1 (2,4%), inferior vena cava 7 (16,6%), named visceral arteries 2 (5%), named visceral veins 8 (19%), iliac arteries 1 (2,4%), and iliac veins 1(2,4%), epigastric, hypogastric, intercostal arteries 6 (14,3%), epigastric, hypogastric, intercostal veins 2 (5%), gonadal vessels 2 (5%), renal veins 3 (7%), non-named mesenteric vessels with segmental bowels necrosis 14 (33,3%). Two or more vascular injuries were found in 6 (14,3%) patients. According to Organ Injury Scaling, 1st grade injuries were found in 17 (40%), 2nd - in 11 (26%), 3rd - in 8 (19%), 4th - in 5 (12%), and 5th - in 1 (2,4%) patients. The most frequent associated injuries were small bowel - 12, liver - 8, colon - 5, stomach 4, duodenum - 4, diaphragm - 3, pancreas - 2, spleen - 1, with an incidence of 29%, 19%, 12%, 9,5%, 9,5%, 7%, 5% and 2,4% respectively. All injuries were managed according to injury score. Infrarenal v. cava ligation was performed in all cases of hemodynamic instability. Minor named abdominal vessels were ligated in all cases. Segmental intestinal resection was performed in all patents with 5th grade of intestinal injuries due to devascularisation. Overall mortality rate was 21%. The vessels with the highest mortality rates were inferior vena cava (71% - 5/7). There were no mortalities in isolated abdominal vascular trauma patients and in cases of 1st grade of injury. Mortality rate in accordance to OIS was: 2nd - 3 patients (27%), 3rd - 3 patients

(37,5%), 4th - 2 patients (40%), 5th - 1 patient (100%). No differences in mortality rate were found according to type of trauma (blunt or penetrating). The associated injuries with the highest mortality rates were pancreas (2/2 - 100%), diaphragm (2/3 - 66,6%), liver (6/8 - 75%), duodenum (2/4 - 50%), colon (3/5 - 60%).

Conclusion: Isolated abdominal vascular injuries are rare and detected only in 21% of patients. High mortality rate is associated with injury grade, hemodynamical status and associated abdominal organ injuries.

Disclosure: No significant relationships.

M077 Endovascular Management of Blunt Renal Artery Trauma. A Case Series and Review of the Literature

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Introduction: Renal artery injuries remain a rare condition in blunt trauma patients. However, the rate of early diagnosis of such injuries is increasing due to increased awareness and the liberal use of contrast enhanced computed tomography. Sporadic case reports have shown the feasibility of endovascular management of blunt renal artery injury. Here we present our experience and review the literature.

Material and Methods: Three blunt trauma patients who suffered from renal artery injury were successfully treated by an endovascular approach at our level one trauma center over a period of 18 months. All three patients were males with a mean age of 16 years (range 4-21). Mechanism of injury was motor vehicle accident in all patients. Diagnosis was established by means of contrast enhanced computed tomography in all cases (irregular enhancement of the kidney in two patients and a non-enhancing kidney in the third). Mean time from injury to endovascular revascularization was 193 minutes (range 150-220 minutes), and mean time from admission to revascularization was 154 minutes (range 110-180 minutes). A metallic stent was used in two cases, while angioplasty alone was performed in a 4 year-old boy.

Results: A good early angiographic result was achieved in all patients. At a mean follow-up of 13 months (range 5-21 months) renal artery was patent in all three patients by means of Duplex ultrasound. Mean renal function of the affected kidney at last follow-up was 33% (range 19-41%) on DTPA renal scan. No early or late complications were encountered. Hypertension was not evident in any of the patients.

Conclusion: Endovascular management for blunt renal artery dissection is safe and feasible. This approach is expected to replace surgical revascularization in most cases.

References: Sangthong B, Demetriades D, Martin M, et al. Management and Hospital Outcomes of Blunt Renal Artery Injuries: Analysis of 517 Patients from the National Trauma Data Bank. Journal of the American College of Surgeons. 2006; 203: 612-7. Bruce LM, Croce MA, Santaniello JM, et al. Blunt Renal Artery Injury:

Incidence, Diagnosis, and Management. Am Surg 2001; 67: 550-6. Barlow B, Gandhi R. Renal Artery Thrombosis Following Blunt Trauma. J Trauma. 1980; 20:614. Haas C, Dinchman K, Nasrallah F, Spirnak JP. Traumatic Renal Artery Occlusion: A 15 Year Review. Journal of Trauma 1998 Trauma 1998; 45: 557-561 Spirnak JP, Resnick MI. Revascularization of Traumatic Thrombosis of the Renal Artery. Surg Gynecol Obstet. 1987; 164:22-6. Whigham CJ, Bodenhamer JR, Miller JK. Use of the Palmaz Stent in Primary Treatment of Renal Artery Intimal Injury Secondary to Blunt Trauma. Journal of Vascular Interventional Radiology. 1995; 6: 175-8.

Disclosure: No significant relationships.

M078 Traumatic Aortic Rupture. A Thirty Year Experience

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Introduction: Traumatic aortic rupture is a rare but extremely lethal condition.

Material and Methods: Over the past 30 years 75 patients were treated for traumatic aortic rupture (TAR) at the University Hospitals Leuven. During this period diagnostic workup and therapy have changed leading to improved outcome. The introduction of endovascular therapy in 1998 was a mile stone. We retrospectively reviewed the diagnostic workup and management of all these patients and compared outcome before and since the era of endovascular therapy.

Results: Based on this experience guidelines for decision making in the management of TAR are formulated.

Conclusion: Diagnostic workup and patient management has evolved over time leading to improved outcome. Based on this experience guidelines for decision making in the management of TAR are formulated.

Disclosure: No significant relationships.

M079 The Thoracic Impact: Three Biomechanical Simulations of Accidents with an Aortic Rupture

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Introduction: In the year 2007 more than 1100 people in Germany died because of a thoracic trauma, about 10 % due to an aortic rupture. This acute traumatic rupture is mostly located in the thoracic part. If the aortic rupture includes all three layers it normally leads to death immediately. So, the understanding of the trauma mechanism is critical for the accident analysis as well as for design purposes of new safety measures and devices. Traditionally crash test dummies have been used in hardware crash test and some injury criteria have been elaborated. With the rapid development of computers the importance of numerical simulation grows. Detailed finite element human models can represent the human subjects much better as the

mechanical dummy, especially the internal forces and strains at the thorax.

Material and Methods: Within a period of two years a database was created at the “Institut für Rechtsmedizin München” with every victim of an accident with heavy thoracic injuries, including all medical findings and analytical results of the accidents. We took 81 cases for further examination. The causes of death were either an aortic rupture (68), a rupture of the pulmonary vessels (8), a rupture of the heart (4) or an aneurysma dissecans with a rupture of the aorta (3). In addition to the detailed forensic examination and autopsy, we took the anthropometrical measurement of all corpses in 3 dimensions, so that we were able to create a biomechanical simulation of the accidents with “finite element models”. There the shear forces affecting the aorta can be calculated. As three forces (frontal impact, side impact and deceleration) are the most important, we will present three comprehensible example accidents. The reason of death is always the “aortic rupture”, but every time the biomechanical way of application of the force was completely different. In detail they are a car accident (frontal collision of a small car with a wall); a downfall from the height of 25 meters in suicidal purpose and a compression of the thorax of a eight year old boy with a shovel of an excavator.

Results: Although all three accidents have completely different course of crash, we were able to see the same reason for death: a rupture of the aorta at the onset of the Ligamentum arteriosum Botalli. By using the numerical simulation, it can be shown that three main directions of force are important in an accident: the frontal impact, the side impact and the deceleration. In all these examples, it was able to simulate the reaction of the aorta in relation to the development of the force. The simulation will be presented as well as all clinical treatment made by the medical staff.

Conclusion: Although the rupture of the thoracic aorta is a frequent cause of death, the injury mechanism has not been completely known. A database with several victims of aortic rupture was created and 3 special accident types will be presented and simulated.

Disclosure: No significant relationships.

M080 Ruptured Abdominal Aortic Aneurysms: Always a Surgical Emergency?

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Introduction: Purpose: To report the successful endovascular repair of a chronic contained rupture of an abdominal aortic aneurysm.

Material and Methods: Case report: We report a 69-year-old Caucasian male who presented with critical ischemia to the left lower extremity. CT-scan showed, besides occlusion of both superficial femoral arteries, a chronic contained rupture of an abdominal aortic aneurysm. The aneurysm was excluded with a stent graft placed through a femoral approach in a semi-urgent procedure. CT-scans at 1, 3 and 6 months demonstrated continued exclusion of the aneurysm.

Results: // Case Report

Conclusion: Chronic contained ruptures of aortic aneurysms are a rare but important subset of ruptured aneurysms, which have a clinical and radiological presentation that is distinctly different from that of acute ruptures. A high index of suspicion is needed to diag-

nose this condition as the presentation may be variable and non-specific. Contrast enhanced CT-scan is the gold standard diagnosing technique for detection of CCR AAA and evaluation of locoregional extension. Treatment consists of surgical intervention with endovascular repair being the treatment modality of choice in anatomical suitable candidates.

Disclosure: No significant relationships.

MONITORING SIC PATIENTS

M081 Predictive Value of Procalcitonin (PCT) for the Development of Complications After Multiple Trauma: is there a Genetic Predisposition?

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Introduction: The early identification of high risk patients after multiple trauma is known to be difficult. A potentially relevant marker in multiple trauma patients is the plasma concentration of procalcitonin (PCT). Therefore, we conducted a prospective cohort study to investigate whether (i) PCT serum levels predict the development of posttraumatic complications and (ii) polymorphisms in the calcitonin (CALCA) gene are associated with PCT levels and posttraumatic complications like SIRS, Multiple Organ Dysfunction Syndrome (MODS) or sepsis.

Material and Methods: The inclusion criteria of this prospective studies were: (i) Injury Severity Score (ISS) > 16; (ii) age 18-60 years; (iii) survival > 48 hours after injury. Blood samples were drawn once daily for systemic PCT concentrations. Furthermore, the clinical course was recorded once daily. Multiple trauma patients were separated, according to the development of MODS, SIRS and sepsis. Statistics: Spearman rank correlation coefficient, logistic regression and analysis, Fishers exact test, Student's t-test, stat. significance p < 0.05.

Results: 137 multiple trauma patients fulfilled the inclusion criteria. PCT plasma levels were significantly higher in patients with sepsis and MODS. Furthermore, PCT revealed a high specificity (99.1%) and overall accuracy (88.1%) in predicting sepsis at day 1 after trauma. No differences were observed for allelic and genotypic distributions between patients and 104 healthy German controls. When trauma patients were grouped according different clinical outcome parameters (sepsis, MODS, SIRS) no association between any of the studied parameters and CALCA SNPs was observed. Additionally, no association was observed between CALCA-SNPs and PCT levels.

Conclusion: We conclude that PCT seems to represent a reliable marker for early prediction of infectious complications after trauma. Furthermore, PCT concentrations have a good predictive value for MODS development in the later clinical course. However, CALCA polymorphisms are unlikely to influence PCT levels and clinical outcome in polytraumatized patients.

Disclosure: No significant relationships.

M082 Early Prediction of Massive Transfusion in the Blunt Trauma Patient and the Role of Thromboelastography

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Introduction: Early prediction of massive transfusion (MT) is critical in the management of severely injured trauma patients. Variables available early after injury including physiologic, laboratory and rotation thromboelastometric (ROTEM) parameters were evaluated as predictors for the need of MT.

Material and methods: After IRB approval, we retrospectively reviewed a cohort of severely injured trauma patients (ISS ≥ 16) admitted to a level 1 trauma center with available ROTEM measurements on hospital admission during a 1-year study period. Patients who received a MT (≥ 10 units PRBC within 24 hours of admission) were compared with patients who did not. Variables independently associated with MT were identified using stepwise logistic regression.

Results: A total of 53 patients met inclusion criteria. Of these, 18 patients (34.0%) received a MT and 35 patients (66.0%) did not. Massively transfused patients had significantly lower baseline hemoglobin values (7.9 ± 0.4 vs. 11.4 ± 0.4 g/dL; $p < 0.001$) and a trend towards higher lactate (4.8 ± 0.8 vs. 3.0 ± 0.3 mmol/L; $p = 0.056$) and base deficit values (5.9 ± 1.1 vs. 3.6 ± 0.6 mmol/L; $p = 0.052$). Mean INR (1.46 ± 0.07 vs. 1.22 ± 0.05 ; $p = 0.001$) and partial thromboplastin times (42.4 ± 5.0 vs. 29.7 ± 1.8 sec; $p < 0.001$) were significantly higher in MT patients. Patients receiving a MT had significantly altered ROTEM values on admission compared to non-MT patients. An increase in the clot formation time (471.3 ± 169.9 vs. 178.1 ± 19.9 sec; $p = 0.001$), a shortening of the maximum clot firmness (37.5 ± 2.9 vs. 50.7 ± 1.4 mm; $p < 0.001$), and a shortening of the clot amplitude at all time-points (10/20/30 minutes) were observed in massively transfused trauma patients. Variables independently associated with MT included a hemoglobin level ≤ 10 g/dL and an abnormal maximum clot firmness value [area under the ROC curve: 0.831 (95% CI: 0.719 – 0.942; $p < 0.001$)].

Conclusion: Readily available variables such as the initial hemoglobin level and rotation thromboelastometry values reliably predict the need for massive transfusion in severely injured patients. Prospective validation of the effectiveness of thromboelastometry to guide the transfusion management in trauma patients is warranted.

Disclosure: No significant relationships.

M083 Increased Plasma Kynurenine Values as a Predictive Marker for the Development of Sepsis After Major Trauma

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Introduction: Kynurenine, the major degradation product of tryptophan has been shown to directly damage tissues but its possible contribution to posttraumatic morbidity is unknown. Herein, we studied the kinetics of kynurenine in patients after major trauma and whether this correlates with development of posttraumatic sepsis.

Material and Methods: Kynurenine and tryptophan of 60 multiple injured patients with Injury Severity Score (ISS) > 16 were quantified prospectively by high-performance liquid chromatography (HPLC). Blood samples were obtained daily from admission until day 10 after admission.

Results: Significantly increased kynurenine values were detectable already at day 1 after admission in blood from patients that later developed sepsis, regardless of injury pattern ($p < 0.01$). In contrast, kynurenine values of non-septic patients remained low throughout the observation period. However, all patients exhibited significantly decreased tryptophan values versus healthy controls ($p < 0.01$). Moreover, significantly increased kynurenine:tryptophan ratios rapidly predicted subsequent sepsis, multiple organ failure, and death ($p < 0.01$).

Conclusion: Both, increased kynurenine values and kynurenine:tryptophan ratios predicted posttraumatic development of sepsis and organ failure.

Disclosure: No significant relationships.

M084 A Role of TLR2 Signaling Late Post-Traumatic Immune Dysfunction

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Introduction: Imbalance in the post-traumatic inflammatory response leads to severe and often fatal complications in multiple trauma patients. Toll-like receptor 2 has been shown to contribute to the early inflammatory response in trauma models. However, the role of TLR2 in delayed immune dysfunction following tissue trauma as seen with severe skeletal injury is unknown. To study the

delayed consequence to severe tissue trauma on immune function, we have developed a novel pseudofracture model which recapitulates the systemic and end organ responses observed following bilateral femur fracture. Using the model we tested the hypothesis that TLR2 contributes not only to the initial inflammatory response following severe tissue trauma, but also the delayed immune dysfunction.

Material and Methods: Male TLR2 knockout and wild type C57/BL6 mice ($n = 4-10$), weighing 20-30 g, were subjected to pseudofracture (crushed bone solution injection and soft tissue injury to the thigh musculature bilaterally) and allowed freedom of movement as anaesthesia subsided. Control mice received no experimental manipulation. At 48 hours, mice were sacrificed. Spleens were harvested for assessment of splenocyte proliferation and Th1 cytokine (Interferon-gamma and Interleukin-2) release in response to the mitogen Concanavalin A ($2.5 \mu\text{g/ml}$). Splenocyte proliferation was assessed through titrated thymidine uptake, measured as counts per minute (c.p.m.).

Results: A significant ($p < 0.05$) decrease ($21,259 \pm 1,723 \text{ c.p.m.}$) in splenocyte proliferation post-pseudofracture was seen in the wild type mice at 48 hours in comparison to controls ($48,103 \pm 4,808 \text{ c.p.m.}$). Splenocyte proliferation in TLR2 knockout mice was similar ($p < 0.05$) to wild type mice at baseline ($46,487 \pm 3,371 \text{ c.p.m.}$). However, in contrast to wild type mice, splenocytes from TLR2 knockout mice proliferated at the same rate as uninjured mice even after injury ($40,249 \pm 1,900 \text{ c.p.m.}$). Splenocyte release of Th1 cytokines was significantly ($p < 0.05$) decreased (IFN- γ : $112.7 \pm 89.8 \text{ pg/ml}$; IL-2: $114.3 \pm 20.2 \text{ pg/ml}$) in injured wild type mice in comparison with controls as expected (IFN- γ : $654.8 \pm 140.5 \text{ pg/ml}$; IL-2: $250.2 \pm 45.2 \text{ pg/ml}$), following concanavalin A stimulation. This significant suppression was not seen in splenocytes from injured TLR2 deficient mice compared with TLR2 deficient controls.

Conclusion: Our novel pseudofracture model leads to delayed immune dysfunction typical of severe injury models. Our observation that delayed immune dysfunction fails to develop in TLR2 deficient animals indicates that TLR2 signaling contributes to the immune dysfunction seen in severe trauma and represents potential as a therapeutic target to limit injury-induced immune suppression.

Disclosure: No significant relationships.

M085 Splenic Immune Function Following Femoral Fracture and Trauma-Haemorrhage

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Introduction: Multiple trauma is associated with a susceptibility for infectious complications in the further clinical course due to immunosuppression. Splenic immune functions were shown to be depressed following trauma-haemorrhage. The present study investigates the influence of femoral shaft fracture isolated or in

combination with trauma-haemorrhage on the suppression of splenic immune function.

Material and Methods: 36 male wild type (C57BL/6) and IL-6 knockout (B6;12952-IL6^{tm1Kopf}) mice (aged 10-12 weeks, weighing 20-22 g) underwent femoral fracture isolated or in combination with induced trauma haemorrhage followed by fluid resuscitation and splint fixation of the fracture. Animals were sacrificed 4 h after induction of fracture and trauma/haemorrhage. Sham group [S] (only anaesthesia), femoral fracture [FF] and trauma haemorrhage/femoral fracture group [TH/FF] were created consisting of 6 wild type and IL-6 knockout mice, respectively. After stimulation of isolated splenocytes with $10 \mu\text{g/ml}$ LPS for 24 h TNF- α and IL-6 concentrations were measured in cell supernatant. Study groups were compared by using one-way analysis of variances (ANOVA) followed by the Student's t-test. The level of statistical significance was considered at $p < 0.05$.

Results: In wild type mice TNF- α and IL-6 release of stimulated splenocytes were significantly decreased after femoral shaft fracture compared to sham animals. After combined femoral fracture and trauma-haemorrhage a further significant decrease of cytokine levels were observed. In IL-6 knockout mice a trauma-dependent, but significantly attenuated decrease of TNF- α was demonstrated compared to wild type animals.

Conclusion: In wild type mice, already an isolated femoral shaft fracture caused a significant suppression of splenic immune functions with a significant decreased cytokine expression. The results of the present study also support the pivotal role of IL-6 in the inflammatory response after trauma.

Disclosure: No significant relationships.

M086 Non Invasive Assessment of Compartment Pressure by Elastography: an In Vitro Model

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Introduction: Overlooked compartment syndrome represents a catastrophic complication for patients and orthopedic surgeons. Invasive compartment pressure measurement continues to be the gold standard. However, repeated measurements in uncertain cases can be difficult to achieve. We, therefore, developed a model for a noninvasive technique to assess tissue pressure by ultrasound based elastography.

Material and Methods: A perforated plastic tube filled with saline was surrounded by a silicone sealed plastic cover, mimicking the shape of the tibial compartment. A pressure transducer inside the compartment was installed. A second pressure transducer was installed on the ultrasound probe to allow simultaneous monitoring of the pressure inside the compartment and the tissue deformity. For calibration, ultrasound images were generated at 0 and 130 mmHg. The plastic cover to tube distance was measured before and after compression (Δd). Subsequently, increments of 5 mmHg pressure increases were used to generate a standard curve (0-60 mmHg), thus mimicking rising compartment pressures. The intra-observer reliability was tested by using 10 subsequent measurements. A correlation was determined between the skin to bone distance (Δd) and the pressure measurement (p). The Pearson correlation coefficient was calculated, and a regression analysis was performed.

Results: With rising compartmental pressure, a reciprocal proportional relation between delta d and p occurred. The Pearson coefficient was significant at $r = -0.960$. Within a pressure ranging from 5 up to 35 mmHg there was an almost linear behavior.

Conclusion: Our model reveals that a close correlation between tissue displacement assessed by ultrasound and intracompartmental pressure changes occurs. Further studies are required to assess whether the good correlation also applies for the clinical scenario. If so, this information may be useful to monitor trends in the compartment pressures with elastographic tools.

Disclosure: No significant relationships.

M087 Functional Outcome Evaluation of Upper Extremity Fractures in Polytrauma Patients. A Long-term Follow Up Study

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Introduction: The aim of this study was to examine the late outcome of upper extremity fractures.

Material and Methods: Patients were re-invited for a follow up physical examination at least one decade after their initial trauma. Polytrauma patients with ISS > 16, treated at the same institution, age between 3 and 58 years were included. Patients were subdivided into three groups, i.e. A: articular fractures (shoulder/elbow/wrist); B: shaft fractures (humerus/radius/ulna); C: combined fractures. A physical exam was performed in all patients, followed by health score assessment (Range of Motion, SF-12 scores, multiple trauma outcome scores). Additionally, all patients filled out a health questionnaire evaluating the patient's subjective outcome.

Results: 149 multiple injured patients matched the inclusion criteria. Their mean age at accident was 26.8 yrs \pm 11.6, the mean age at follow up was 44 yrs \pm 11.9. The mean time between accident and follow up was 17.1 yrs \pm 5.6. 60 patients belonged to group A, 37 to group B and 52 to group C. A statistically significant difference was found when the HASPOC was compared between Group A versus Group B ($P = 0.024$) and Group B versus Group C ($P = 0.01$). Also significant difference was found when the local Abbreviated Injury Score (AIS) was compared between Group B versus Group C ($P = 0.007$) and Group A versus Group C ($P = 0.001$). Statistical significant occurred in the physical portion SF-12 between Group B versus Group C ($P = 0.018$) and Group A versus Group B ($P = 0.027$). A statistically significant difference was found when ROM was compared between Group B versus Group C ($P = 0.012$). Also significant difference could be shown when we compared the number of patients experiencing a contracture between Group A versus Group C ($P = 0.009$). Comparing the number of patients with

full muscle elbow force between Group A versus Group C ($P = 0.005$) and Group A versus Group B ($P = 0.021$) was also showed to be statistical significant.

Conclusion: Long-term outcome of patients after upper extremity fractures seems to be determined by their site of injury. Patients with combined fractures (more than one fracture in the same extremity) show less favorable outcome in respect to ROM, HASPOC and AIS when compared to the two other groups. Also muscle strength proved to be less in Group C. Additionally, patients from Group C showed more stiffness of the extremity. This could be explained that patients with combined fractures usually have more than one injury site which can lead to delayed fracture treatment and late rehabilitation.

Disclosure: No significant relationships.

M088 Emergency Trauma Score (EMTRAS)

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Introduction: Early estimation of the mortality risk of severely injured patients is mandatory. To estimate the seriousness of the condition of trauma patients we developed the Emergency Trauma Score (EMTRAS) for ease of use, with simple parameters that are available within 30 min.

Material and Methods: EMTRAS was derived from data from 1993 through 2003. Potential parameters that were prognostic for mortality in univariate analysis were evaluated by multivariate binary logistic regression. Selected parameters were then assigned a sub-score that varied from 0 to 3. The EMTRAS score was a simple addition of these subscores. EMTRAS was compared with other scores receiver operating characteristic curves. After completion EMTRAS was validated in patients from 2004 and 2005. 11533 patients were to be used for developing the score and 3314 patients for validating it.

Results: The strongest predictors of mortality were: age, prehospital Glasgow coma scale (GCS), base excess (BE; mmol/l), and prothrombin time (PT; % of reference). These parameters were categorized in sub-scores of 0 through 3. Age: 75 scored 0, 1, 2 and 3. GCS: 13 through 15, 10 through 12, 6 through 9 and 3 through 5 scored 0, 1, 2 and 3. BE: > -1, -5 through -1, -10 through -5.1 and

Conclusion: EMTRAS combines four early parameters from the ER, and accurately predicts mortality. Knowledge of the anatomical injuries is not necessary. The determination of the EMTRAS will inform caregivers of the seriousness of trauma patients at an early stage.

References: 1. Oestern HJ, Kabus K: Comparison of various trauma score systems. An overview. *Unfallchirurg* 1994; 97:177-184. 2. Baker SP, O'Neill B, Haddon W Jr, et al: The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974; 14:187-196. 3. Boyd CR, Tolson MA, Copes WS: Evaluating trauma care: the TRISS method. *Trauma score and the injury severity score. J Trauma* 1987; 27:370-378. 4. Taeger G, Ruchholtz S, Waydhas C, et al: Damage control orthopedics in patients with multiple injuries is effective, time saving, and safe. *J Trauma* 2005; 59:409-416.

Disclosure: No significant relationships.

ABDOMEN

M089 Open Abdomen? And Now? What to do?

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Introduction: With time the way in which trauma surgeons approach trauma patients has changed. Before a surgeon would fight a battle against time trying to fix all problems at the same time, now it is known that short operative times and conservative measures and techniques increase survival of patients with multiple trauma. Tackling in account the Damage-control principles de abdominal trauma patient may benefit of a Celiotomy and stay with the abdominal wall open, with a temporary abdominal closure technique, when there is expected an Abdominal Compartment Syndrome to develop. But, after controlling all the life threatening lesions and fixing all organs the surgeon has to close the abdomen.

Material and Methods: There are several Methods of Definitive Abdominal Wall Reconstruction such as primary delayed fascial closure, the Fabian Protocol, Sure-closure system®, Vacuum assisted closure® and the dynamic fascial wound closure system (ABRA®) all showing promising long-term results.

Results: The Authors chose to present a case of open abdomen due to hemoperitoneum treated with dynamic fascial wound closure system (ABRA®).

Conclusion: The abdomen was closed in a total time of eleven days, with complete definitive closure of all layers of the abdominal wall.

Disclosure: No significant relationships.

M090 A Vacuum-Assisted Technique for Treating the Abdominal Compartment Syndrome

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Introduction: The management of the abdominal compartment syndrome (ACS) is to decompress the abdomen and leave it open for a long period. Many techniques of covering this "open" abdomen have already been proposed, with different results in the morbidity and the mortality of the patients.

This study demonstrates our experience on this field, with the use of our vacuum- assisted technique of treating an open abdomen.

Material and methods: Six patients (4 men, 2 women) were treated for the ACS (January 2007 – June 2009). Three patients were multiple trauma victims, two other patients suffered from necrotic pancreatitis and one patient was operated for an oncology problem. Men age of patients was of 51.9 years.

Results: Our technique includes the placement of a transparent sterile drape over the double layer of parenteral nutrition bag, fixed on the surgical wound. Between the two sheets of the sac, two or more drainage tubes are placed, to provide the optimal aspiration of the abdominal liquids. Thus, the aseptic closure, the cleaning and the inspection of the surgical wound in a 24 hour base is ensured. With the use of this technique, all patients were cured and their surgical wound was closed in a second way on four of them. Mean period of hospitalization was of 62 days (37-75 d).

Conclusion: Our vacuum-assisted technique of treating an open abdomen for ACS, seems to have good results in both the patient's mortality and the final healing of the surgical wound. In addition the cost of this method is extremely low and the care of the surgical wound is very easy.

Disclosure: No significant relationships.

M091 A Nationwide Survey on Temporary and Delayed Abdominal Closure in Norwegian Hospitals

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Introduction: Although improved resuscitation protocols, increased awareness about Abdominal Compartment Syndrome (ACS) and formal protocols for temporary abdominal closure (TAC) has made ACS uncommon, it is still a feared complication in trauma patients and other critically ill patients like abdominal sepsis. Untreated the condition has a high mortality rate. The treatment consists of abdominal decompression and TAC. Follow-up of patients with TAC, whether closure of the abdomen is achieved by delayed primary closure or by secondary reconstruction later represents challenging multidisciplinary teamwork. The aim of the present study was to define the frequency and indications for TAC, the frequency of ACS, the choice of TAC procedure and further treatment in Norwegian hospitals.

Material and Methods: A questionnaire was sent to surgical departments in all 53 Norwegian hospitals.

Results: An 85% response rate was achieved (45 of 53 hospitals). 12 of the hospitals (27%) had treated patients with TAC after abdominal injury during the last 5 years, moreover only 2 of the hospitals had treated more than one patient per year. A total of 29 hospitals (64%) reported that they would refer patients with TAC after damage control surgery to a trauma center. A total of 22 hospitals (49%) had treated patients with ACS (regardless of etiology), but only 6 of the hospitals had treated more than one

patient per year. Most hospitals use well established techniques for TAC with vack pack (25 hospitals) and KCI VAC Â® (12 hospitals) dominating. When secondary reconstruction after TAC is indicated, 21 hospitals (47%) would refer patients to a higher level institution.

Conclusion: The study indicates that most Norwegian hospitals get minimal experience with TAC both as a prophylactic measure after damage control laparotomy and as treatment for ACS. Most hospitals would refer patients with TAC after damage control surgery to a trauma center, while more than half would perform a potential secondary reconstruction themselves. We think the treatment of patients with TAC could be optimized if the patients were managed in one or a few regional trauma centers.

Disclosure: No significant relationships.

M092 Abbreviated Laparotomy Using Temporary Closure with the Bogota Bag for Severe Abdominal Sepsis

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Introduction: Severe peritonitis remains a life-threatening condition especially in elderly patients (1). The role of the surgeon has been progressively marginalized due to the development of modern intensive care technology (2), better antibiotics and computed tomography-guided percutaneous drainage (3). However, when everything else has failed, the burden of decision making the choice of a 'last resort' operation will be shifted again to the surgeon. We here described our recent experience with 10 such cases treated by abbreviated laparotomy using the Bogota bag technique (4).

Material and Methods: From October 2007 till May 2009, 10 patients (6F/4H) age ranging from 49 to 83 were referred to us with severe peritonitis. The etiology was perforated diverticulitis (Hinchey stage 4) in four patients, referred colonic anastomosis leakage in three, perforated ischemic colon in two after repair of abdominal aortic aneurysm and perforated occlusive tumour of left colon in one.

Results: For the seven first patients, we performed colon resection with colostomy. After extensive debridement, lavage and drainage, the peritoneal cavity was closed with a sterile gastric bag sutured on the rectus aponeurosis according to the so-called Bogota-bag procedure (5). The mean operative time was 75 minutes. A second look laparotomy was planned after 48 hours: one patient required one re-exploration, four patients required two and two required three. The decision of re-exploration was based on the visual aspect of the peritoneal content, the clinical evolution and the bacteriologic results. For the last three cases, we elected perform colon resection without colostomy followed by anastomosis in two patients in the second look laparotomy and colostomy in one because of two re-laparotomies. None of the ten patients required further percutaneous drainage. Two patients died in multiple organs failure (one with perforated diverticulitis and one with ischemic colon after aneurysm repair).

Conclusion: Abbreviated laparotomy with temporary closure of the abdominal wall associated with planned re-exploration of the peritoneal cavity is a simple and effective way to treat patients with severe abdominal sepsis.

References: 1. Pacelli F, Doglietto GB, Alfieri S et al. Prognosis in intra-abdominal infections: multivariate analysis in 604 patients. *Arch Surg* 1996;131:641-45 2. Parc Y, Frileux P, Schmitt G et al. Management of postoperative peritonitis after anterior resection. Experience from a referral intensive care unit. *Dis Colon rectum* 2000;43:579-89 3. Cinat ME, Wilson SE, Din AM. Determinant for successful percutaneous image-guided drainage of intra-abdominal abscess. *Arch Surg* 2002;137:845-49 4. Kirstein B, Roy-Shapira A, Lantsberg L et al. Use of the 'Bogota bag' for temporary abdominal closure in patients with secondary peritonitis. *Am Surg* 2007;73:249-52

Disclosure: No significant relationships.

M093 Are Biologic Mesh Repairs the Answer for Complicated Abdominal Wall Defects and for Patients with Enterocutaneous Fistulae?

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Introduction: Abdominal wall hernia is an important disease that affects many individuals. The most difficult patients are those with large and complex abdominal wall defects due to open abdomen trauma management patients, those with multiple co-morbidities undergoing repair of recurrent hernias, or those with enterocutaneous fistulae. Recent introduction of acellular dermal matrix (ADM) and other biological mesh as paradigm in repair and reconstruction of abdominal wall hernias provides an advantage over non-biological materials with allowance of implantation into infected fields. No standardized method of repair exists for use of ADM abdominal wall reconstructions.

Material and Methods: Retrospective chart review the use of ADM for abdominal wall reconstructions from 2006 to 2009. Operations included were indicated for complex abdominal reconstruction for complicated recurrent abdominal hernias, abdominal defects secondary to trauma open abdomen management, and reconstruction of abdominal domain for enterocutaneous fistulae.

Results: Thirty patients were identified with 31 implants of ADM completed for 11 trauma open abdomens, 10 complicated abdominal surgeries, 11 hernias with 81% recurrent cases. 29% of all operations were completed for treatment of enterocutaneous fistulae. Technique of repair was distributed with 20 cases of inlay, 3 cases onlay, and 7 cases with ADM implanted as a bridge. Adjuncts to operative technique were component separations, lateral release, and 77% of cases included placement of drains or application of vacuum assisted closure (VAC) therapy. Length of hospital stay ranged from 0 days to 58 days, mean follow up was 3.22 months and mean interval free hernia was 3 months.

Conclusion: Modern treatment and repair of hernias has undergone revolutionary advances in techniques and materials. Despite these advances, many patients with prior surgery suffer significant morbidity and mortality undergoing hernia repair operations. Persistent seromas, fistulas, and adhesions continue to plague hernia reconstructions. In our current review, we propose the ADM implantation provides an advantage over other mesh hernia repairs and is a valid option for treatment of enterocutaneous fistulae. We propose that

placement of drains, component separation, and lateral release decrease the sequelae of postoperative complications and may increase durability of hernia repair.

Disclosure: Member of speakers bureau

M094 Percutaneous Cholecystostomy in Acute Cholecystitis in High-Risk Patients: Bridge to Surgery or as a Definitive Treatment?

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Introduction: The aim is to document the safety and efficacy of percutaneous cholecystostomy (PC) in high-risk patients with acute calculous cholecystitis either as definitive treatment or as a bridge to interval cholecystectomy.

Material and methods: Twenty-three patients, representing 31% of all acute cholecystitis patients managed in a 2.5-years' period in a university hospital setting, underwent PC. Age, co-morbid illnesses, ASA score, presenting status of the patient, complications, interval surgery, and final outcome were analysed.

Results: Mean age was 74,3 ± 9,8 years (range 43-93 yrs). All patients were ASA score III/IV. 7 patients presented with sepsis/septic shock and 8 were admitted to the ICU; 8 were chronically hemodialysed; 7 had cholangitis and/or pancreatitis and 5 underwent ERCP during the same admission. 4 patients (17%) had to be operated on 0-7 days after PC due to inadequate clinical improvement/progression of the disease; however, 2 of them died due to multiorgan failure (overall mortality rate was 13% together with another patient who died without having an operation). 8 patients had interval surgery 6 to 14 weeks after PC with no mortality. In eleven patients, the catheter was withdrawn after clinical and radiological improvement without any additional operation (48%). Success rate of PC was 78%.

Conclusion: PC is a safe and effective procedure in high-risk patients with calculous cholecystitis. Elective cholecystectomy should be considered after optimization of the medical condition of the patients; however, PC may also be the definitive treatment in elderly patients with serious co-morbid illnesses.

Disclosure: No significant relationships.

M095 Complications of Acute Appendicitis

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Introduction: Complications of acute appendicitis are recognized as early and delayed. Early postoperative complications are the response on the stage of the inflammation, oldage of the patient, and appropriate surgical technique. Delayed postoperative complications are recognized as: abscess of the abdominal cavity, adhesive ileus or rebound pain.

Material and Methods: In the period from 2002. until October 2009. at Surgical Clinic, Clinical – Hospital Center Pristina – Gracanica total number of abdominal operations was 3.155, vs. appendectomy 544 (17,2%). Acute appendicitis was the cause of the operation in 534 (98,2%) patients, chronic form of appendix inflammation was found

in 9 (1,6%) patients and adenocarcinoma appendix 1(0,18%). Regarding to gender, male patients were presented in 288 (52,9%) cases and female in 256 (47,10%).

Results: Acute form of appendix inflammation was found in 534 (98,2%) patients. In regard to the pathohystological findings, of the inflammation forms phlegmonose appendicitis was found in 320(59,9%), gangrenous 224 (41.9%) of with perforation of the appendix in 94 (17,6%-41,9%) patients. Patohistological verification 498(91,5%). Peritonitis was presented in 143(26,8%): Diffuse peritonitis was presented in 93 (17,4%/65,03%) patients, and localized in 50 (9,4%-34,97%) patients. Early form of postoperative complications was presented in 19 (3,5%) cases: o wound infection in 16 (2,94%) cases, abdominal bleeding in 0 (0,00%) patients, dehiscence of the appendicall radix in 1(0,18%) patients, ileus in 7 (1,3%) patients, thrombophlebitis in 2(0,4%) patient, cardio respiratory disorders in 6(1,1%) patients and urinary disorders in 5 (0,9%) patient. Delayed forms of complications was found in 8 (1,44%) patients: wound infection in 2 (0,36%) patients, abdominal cavity abscess in 2 (0,36%) patient, adhesive ileus in 3 (0,6%) patient, rebound pain in 5 (0,94%) patient. Overall morbidity was 22 (4,96%). This study shows no mortalities.

Conclusion: Early visit to the doctor, as soon as symptoms occurs, correct physical examination and adequate surgical procedure are essential for minimal occurring of the complications in appendicitis

Disclosure: Complications of acute appendicitis are recognized as early and delayed. Early postoperative complications are the response on the stage of the inflammation, oldage of the patient, and appropriate surgical technique. Delayed postoperative complications are

M096 Perforated Peptic Ulcer. Lethal complication of a Vanishing Disease

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Introduction: Peptic disease is prevalent and affects millions. Vast use of PPI and H₂ blockers and eradication of Helicobacter Pylori have decreased significantly the need for elective surgery. Emergency surgical interventions for complications such as perforation are on the rise.

Material and Methods: To characterize patients who experienced perforated ulcer disease and to identify variables that may predict outcome and mortality. Charts of patients operated in our department from January 2000 through January 2009 for perforated ulcer disease where reviewed retrospectively. Age, gender, perforation to operation interval, diabetes, tobacco use, use of NSAID's, history of peptic ulcer disease, leukocytes count, blood and urine amylase, lactic acid, radiology studies used prior to surgery, length of surgery, post operative complication, in hospital mortality and at 6 and 12 months where recorded. Results where tested using U-Mann Whitney test and P < 0.05 was considered statistically significant.

Results: 41 patients where operated for perforated peptic ulcer disease in the study period. Mortality was 27% (11 patients), 11% had a prior history of PUD. Average age of the deceased (group I) was 75 Vs 51 of the surviving patients (group II) (P < 0.001). No age/gender difference was found in the group of deceased, while age of the females subgroup in the survivors group was significantly higher (60

Vs 46 P = 0.007). 82% of patients in group I where diagnosed by CT scan while only 56% had this study in group II. Blood Lactate levels where significantly higher in the group I (5 Vs 2.5 mg/dl P = 0.019). No differences in blood amylase or in leukocytes count were found. Urinary amylase was significantly higher in group II. Perforation to operation interval was not different between the two groups (35.2 h Vs 31.6 h). Operating time was not different between the two groups (62 Vs 65 min). Diabetes Mellitus was found in 36% of the deceased Vs 10% of the control group (P = 0.069).

Conclusion: Age and not perforation to operation interval in the patients reviewed were the most important predicting factor for mortality and worse clinical outcome. Diabetes is an independent risk factor for death among patients suffering PUD perforation. Worse clinical course and death are to be expected in patients with high blood lactate levels. Females with perforated ulcer are more likely to survive than men.

Disclosure: No significant relationships.

PELVIS

M097 Early Prediction of Pelvic Fracture-related Arterial Bleeding During Trauma Resuscitation: a Prospective Clinical Study

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Introduction: The early identification of pelvic fracture-related arterial bleeding (PFRAB) is crucial in the management of patients with high-energy pelvic fractures. Aim: to determine predictors of PFRAB from the information available in the Emergency Department (ED).

Material and Methods: 3-year prospective study ending in Dec 2008 was performed in a Level-1 Trauma Centre. Consecutive high-energy pelvic fracture patients older than 18yrs were included. Patients who arrived >4 h after injury and dead on arrival were excluded. Collected data included: patient demographics, mechanism of injury, vital signs, acid-base status, fluid resuscitation, trauma scores, fracture pattern, procedures and outcomes. PFRAB was determined based on angiography or CT-angiogram or laparotomy findings. Univariate analysis, Pearson correlation (r), multiple logistic regression and receiver operator characteristic (ROC) analysis were used to identify potential predictors.

Results: From the 143 study patients 15 (10%) had PFRAB. Patients with PFRAB were significantly older, more severely injured (ISS, AIS pelvis), more hypotensive, more acidotic, more likely to require transfusions in ED and had higher mortality than no-PFRAB patients. Worst ED base deficit (BD worst) was the strongest independent predictor (ROC: 0.77, cut-off: 6 mmol/L, r = 0.37). BD \geq 6 mmol/L had OR = 5.24. ED transfusion (yes/no) had r = 0.47 with PFRAB. Demographics, mechanism, fracture pattern, temperature, vital signs, pH had poor prediction value.

Conclusion: BD worse than 6 and the need for transfusion in ED are the only valuable independent predictors of PFRAB in ED. After exclusion of abdominal, chest and extremity bleeding these predictors can be valuable to triage blunt trauma victims for pelvic haemorrhage control with angiography or pelvic packing depending on the institutional protocol.

References: Heetveld MJ, Harris I, Schlaphoff G, et al. Guidelines for the management of haemodynamically unstable pelvic fracture patients. ANZ J Surg. 2004; 74(7):520-9. Gansslen A, Giannoudis P, Pape HC, et al. Hemorrhage in pelvic fracture: who needs angiography? Curr Opin Crit Care. 2003; 9:515-23. Sarin EL, Moore JB, Moore EE, et al. Pelvic fracture pattern does not always predict the need for urgent embolization. J Trauma. 2005; 58:973-7. Starr AJ, Griffin DR, Reinert CM, et al. Pelvic ring disruptions: prediction of associated injuries, transfusion requirement, pelvic arteriography, complications and mortality. J Orthop Trauma. 2002; 16(8):553-61. Salim A, Teixeira P, DuBose J, et al. Predictors of positive angiography in pelvic fractures: A prospective study. J Am Coll Surg. 2008; 207(5):656-62. Blackmore CC, Cummings P, Jurkovich GJ, et al. Predicting major hemorrhage in patients with pelvic fracture. J Trauma. 2006; 61:346-352. Miller PR, Moore PS, Mansell E, et al. External fixation or arteriogram in bleeding pelvic fracture: Initial therapy guided by markers of arterial hemorrhage. J Trauma. 2003; 54(3):437-43.

Disclosure: No significant relationships.

M098 Intra-abdominal Injuries Associated with Severe Pelvic Fractures and Haemodynamic Instability

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Introduction: Mortality in patients with haemodynamic instability associated with pelvic fractures remains high (25-50%). Associated abdominal injuries is common and early diagnosis is the key for optimal treatment. We report the epidemiology, associated intra-abdominal injuries, diagnosis and surgical treatment of a group of polytrauma center attended at a single Trauma Center.

Material and Methods: Retrospective review of prospective collected data in Trauma registry. We reviewed a group of 114 patients admitted at our Hospital with pelvic fracture and hemodynamic instability between 1998 and 2008. 73 patients had associated intra-abdominal injuries. Most of patients were treated with a standardized protocol. Main data: demographic data, mechanism, prehospital transport, ISS, NISS, associated injuries, surgical treatment (laparotomy, pelvic fixation and embolization) and mortality.

Results: 64% (73 patients) had intra-abdominal injuries. Mean age were 37.7 yrs. The most frequent mechanism were RTA (40%). Most patients (90%) were transferred to Hospital by mobil ICU or helicopter. Mean ISS for the whole group were 39.1, for the associated intra-abdominal were 43.2. We found 91 intraabdominal injuries. 30 laparotomies were performed, all associated with angioand/or external fixation (12 angio embolization, 12 extrarenal fixators and 5 with both techniques). Mortality rate in the laparotomy group were 26.6%, which was higher than the mortality rate for the whole group (18.4%, P > 0.05).

Conclusion: Associated abdominal injuries in pelvic fractures is frequent in our experience, although not all need laparotomy. Patients with pelvic fractures and abdominal injuries have a higher mortality rate. A multidisciplinary approach is essential for adequate treatment of these patients. A Hospital adapted algorithm is strongly recommended.

References: 1.-Direct retroperitoneal pelvic packing versus pelvic angiography: A comparison of two management protocols for haemodynamically unstable pelvic fractures.

Osborn PM, Smith WR, Moore EE, Cothren CC, Morgan SJ, Williams AE, Stahel PF. *Injury*. 2009 Jan;40(1):54-60. Epub 2008 Nov 30. 2.-Free abdominal fluid on ultrasound in unstable pelvic ring fracture: is laparotomy always necessary?

Ruchholtz S, Waydhas C, Lewan U, Pehle B, Taeger G, Kühne C, Nast-Kolb D.

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J Trauma. 2004 Aug;57(2):278-85; discussion 285-7.

3.-Associated injuries in severe pelvic trauma]

Siegmeth A, Müllner T, Kukla C, Vécsei V. *Unfallchirurg*. 2000 Jul;103(7):572-81.

Disclosure: No significant relationships.

M099 Functional Outcome and Quality of Life in Patients with Unstable Pelvic Fractures

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Introduction: Pelvic ring fractures are uncommon, but the cost to society can become quite high. Pelvic fractures can be classified according to their mechanical stability, and outcome of mechanically unstable fractures is unfavorable to that of stable fractures. Much research has been done on the early outcome and management of unstable pelvic fractures, but much less on the long term outcomes, especially quality of life. Aim of this study was to describe long term quality of life and functional outcome of patients with unstable pelvic fractures, and identify major influencing factors.

Material and Methods: A cohort of 60 patients admitted to the UMC St. Radboud with Tile B or C pelvic fractures, between January 2006 and December 2008, was asked to fill out a translated version of the SF-36 and the Majeed score, a pelvic fracture specific functional outcome measure. Additionally, a follow up consult which included additional questions, physical examination and radiographic imaging if no recent images were available.

Results: Of 60 patients, 15 were lost to follow up (25%). Of 45 patients contacted 35 consented to a follow up visit (78% response). 78% was male. 42% had Tile B. Average age was 42.1 years (range 18-77) Mean ISS was 31.1 (range 4-75). 3 patients had already been diagnosed with pseudo arthrosis. No additional patients were seen with non- or malunion. Most limitations in physical activity in the SF-36 were related to injuries other than the pelvic fractures in themselves. Mean Majeed score was 75.9 out of 100 (range 18-100), indicating good functional outcome of the operated pelvic fracture.

Conclusion: Most impairment of quality of life as well as of functional outcome could not be ascribed to the pelvic fractures, but correlated highly with associated or concomitant injuries, especially fractures of extremities and severe neuro-trauma.

Disclosure: No significant relationships.

M100 Functional Outcome of Open Book Lesions: a 13-Year Cohort Study

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Introduction: Our objective was to analyze injury pattern, surgical therapy, radiological results and functional outcome in unstable open book lesions (Tile type B1) in the last 13 years in our Level I University Trauma Center.

Material and Methods: A chart review of all patients, who presented between 1 January 1996 and 31 December 2008 with an open book pelvic fracture (Tile type B1), was performed. General demographics, treatment method, anatomic results, complications, re-operations, length of hospital stay and functional outcome were recorded.

Results: Thirty-eight patients were included. Median follow-up time was 43 months. There were 35 male patients (92%). Median ISS was 27.5. Most frequent associated lesions were scrotal and peritoneal hematomas. A preoperative defect of the sacral plexus was diagnosed in 2 patients. In 2 cases the pelvic ring lesion was combined with an acetabular fracture. 21% of the lesions were primarily stabilized with a pelvic girdle or external fixator, 36% of the fractures were operated within 24 hours after admission to our hospital. 71% of the fractures were stabilized anteriorly with ORIF, 29% needed an additional stabilization of the posterior pelvic ring with screws in the sacroiliac joint, and one sacroiliac joint was stabilized with a plate osteosynthesis. Mean operation time was 79 minutes; mean blood loss was 155 ml. Early postoperative complications arose in 9 patients (24%). 2 early revisions were performed because of early infection, 2 times a hematoma was decompressed. In all cases an anatomic reposition was obtained. There was no secondary neurological damage. Patients resumed work at an average of 11 weeks postop. In 77% they returned in the same job, in 23% in the same job with reduced performance. At follow up the median Majeed Score were 93.25. 97% of our patients with an open book pelvic fracture were satisfied or extremely satisfied at follow-up.

Conclusion: When treated adequately with early ORIF, open book lesions may heal uneventfully and lead to excellent and good functional outcome in the great majority of patients.

References: Burkhardt M, Culemann U, Seekamp A, Pohlemann T. Strategies for surgical treatment of multiple trauma including pelvic fracture Review of the literature. *Unfallchirurg* 2005;108:812-820. Rommens PM, Gercek E, Hansen M, Hessmann M.H. Mortalität, Morbidität und funktionelles Endergebnis nach Open-book-Verletzungen und lateralen Kompressionsverletzungen des Beckenringes. *Unfallchirurg* 2003;106:542-549. Rommens PM, Vanderschot PM, De Boodt P, Broos PL. Surgical treatment of pelvic ring disruptions. Indications, techniques and functional results. *Unfallchirurg*;95:455-62. Pohlemann T, Gansslen A, Schellwald O, Culemann U, et al. Outcome evaluation after pelvic ring injuries. *Injury* 1996;27:31-38. Demetriades D, Martin M, Salim A, Rhee P, et al. The effect of trauma center designation and trauma volume on outcome

in specific severe injuries. *Ann Surg* 2005;242:512-517. Tile M. Fractures of the pelvic and acetabulum, 2nd edn. Williams and Wilkins, Baltimore. Van den Bosch E, van Zwiene CMA, Hoek van Dijke GA, et al. Sacroiliac screw fixation for Tile B fractures. *Journal of trauma injury, Infection and critical care* 2003; 55:962-965. Dunivan GC, Hickman AM, Connolly A. Severe Separation of the pubic symphysis and prompt orthopedic surgical intervention. *Obstet. Gynecol.* 2009 Aug;114:473-75. Magnussen RA, Tressler MA, Obrensky WT, et al. Predicting blood loss in isolated pelvic and acetabular high-energy trauma. *Orthop. Trauma* 2007;21:603-7. Bacque P, Trojani C, Delotte J, et al. Anatomical consequences of an open book pelvic ring disruption. A cadaver experimental study. *Surg Radiol Anat* 2005;27:487-490. Ebraheim NA, Mekhal AO, Checroun AJ, et al. Vertical displacement of the symphysis pubis in unilateral open book pelvic injury. *Am J Orthop* 1997;26(7):502-506.

Disclosure: No significant relationships.

M101 Long Term Functional Outcome of Pelvic Fracture Polytrauma Patients to a Mean Follow-up Interval of 15 Years

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Introduction: Pelvic fractures usually are the result of high energy trauma and such patients often have many associated injuries. Long term outcome data of pelvic injury patients is sparse, we present our information with special emphasis on poly-trauma patients, with consideration for the combined involvement of associated injuries on functional outcome.

Material and Methods: General functional outcome and clinical outcome were determined with an examination by a physician and patient assessment at a minimum of 10 years after the injury. Pelvic fracture patients that had suffered poly-trauma were categorized by fracture location: acetabular, pelvic ring, or a combination.

Results: The long term outcome in the patients with pelvic ring fractures (exclusive of acetabular fracture) was the worst clinically, as evidenced by evaluation of pain(29.3%), increased use of special medical aids(37.4%), a poor Merle d'Aubigne score(13.1%), and worse SF-12 and HASPOC scores. Patients with acetabular fracture had poorer general functional outcomes than those with combined pelvic acetabular fractures and were noted to have higher incidence of associated injuries such as type IV Pipkin fractures. Further sub-categorization of pelvic ring fractures into anterior, posterior or combination showed specifically those patients with combined anterior posterior pelvic ring fractures had the worst long term outcome.

Conclusion: A combined anterior posterior pelvic ring injury accounts for the worst long term outcome of pelvic injury poly-trauma patients. We found that bilateral pelvic injury and particular associated injuries greatly influence long term functional outcome.

Disclosure: No significant relationships.

M102 Neurologic Lesions in Unstable Pelvic and Acetabular Fractures

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Introduction: Neurologic lesions in patients who underwent a pelvic ring or acetabular fracture are frequent, up to 33% of cases, and up to 57% of cases in some pattern of sacral fracture. Neurologic deficits can affect patient's mobility, urinary continence and sexuality and can therefore play a big role in determining a patient's posttraumatic poor quality of life. Orthopaedic surgeons have to maintain a high level of suspicion to identify these too often missed injuries. Moreover, a rigorous surgical technique must be applied to avoid iatrogenic damage, present up to 18% of cases.

Material and Methods: A review of the literature was performed to find epidemiological and clinical data, principles of treatment and outcome measurement regarding neurologic complications in fractures of the pelvis and acetabulum.

Results: A practical guide-line was developed for management of acute and chronic neurologic lesions. A thorough clinical examination must be performed to early identify major and minor deficits. In doubtful cases, electrophysiologic tests can help to define the level and the extent of the neurological damage. An early, anatomic reduction and fixation of acetabular and pelvic fractures is the key for a prompt neurological recovery: up to 60% of deficits are only temporary, and a "wait and see" approach is advisable in isolated lesions. At the follow up, a lack of improvement of deficits can suggest the need of surgical repair. Main treatment options include neurolysis, resection of neuromas and nerve repair with direct suture or grafts. Patients with irreparable damages can benefit from muscle and tendon transfer.

Conclusion: Neurologic lesions associated with pelvic or acetabular fractures are associated with a high incidence of posttraumatic deficits, pain and disability. Especially in polytrauma patients, these lesions can suffer from insufficient diagnosis and treatment due to all other overwhelming and sometimes life threatening injuries. An early multidisciplinary approach is mandatory to guarantee an early diagnosis and the best possible functional recovery

References: 1- Denis F, Davis S, Comfort T: Sacral fractures: An important problem. Retrospective analysis of 236 cases. *Clin Orthop* 227:67-81, 1988. 2- Majeed SA: Neurologic deficits in major pelvic injuries. *Clin Orthop* 282:222-228, 1992. 3-Helfet DL, Koval K, Hissa EA, et al: Intraoperative somatosensory evoked potential monitoring during acute pelvic fracture surgery. *J Orthop Trauma* 9:28-34, 1995. 4-Issack PS, Helfet DL: Sciatic Nerve Injury Associated with Acetabular Fractures, *HSSJ* 2009-5:12-18 5-King, J.: Impotence after fractures of the pelvis. *J Bone Joint Surg Am*, 57: 1107, 1975 6-Haidukewych, Iatrogenic Nerve Injury in Acetabular Fracture Surgery: A Comparison of Monitored and Unmonitored Procedures. *Journal of Orthopaedic Trauma*, 2002:16-5, 297-301 and others (no more space)

Disclosure: No significant relationships.

M103 Stabilisation of Fatigue Fractures of the Dorsal Pelvis with Trans-Sacral Bar. Preliminary Results in 5 Patients

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Introduction: Due to aging of our population the number of fatigue fractures of the pelvic ring is quickly growing. These fractures are often treated with bed rest but may result in a disabling immobility with severe pain. An operative treatment is indicated in fractures with instability and dislocation. The aim of the operative treatment is bony healing obtained by stable fixation giving back to the patient his previous mobility. Optimal surgical treatment is still under debate, when complete transforaminal or lateral fractures of the sacrum are present. Most commonly sacroiliac screws are used. Only low compression in the fracture site is obtained due to low density of spongy bone in which the screws are inserted. Therefore the new trans-sacral bar compression osteosynthesis is used. The purpose of this study is to report of our first cases.

Material and Methods: From 2005 to 2008 5 patients (3 F and 2 M) were treated with a trans-sacral bar and followed prospectively. The patient is placed in prone position on the operation table. Under image intensifier control, a 5 mm threaded sacral bar is inserted through the body of S1 from the left to the right dorsal ilium. Nuts are placed over the bar achieving fracture compression. When anterior pelvic instability is present, an anterior osteosynthesis is also performed.

Results: The mean age of the patients was 70 years. The mean duration of follow-up was 18 months. No intra- and postoperative complications were found. At the time of the last evaluation all but one fracture had united. In one case only a partial union could be achieved. Instability significantly improved and pain diminished in all patients with bony healing.

Conclusion: Using a trans-sacral bar for stabilisation of the dorsal pelvic ring in fatigue fractures is a promising method. Only with this method, a high interfragmentary compression is achieved, which is not dependent on the quality of the spongy bone of the sacral body.

Disclosure: No significant relationships.

M104 Evaluation of the use of C-Arm Based Flatpanel Technology in 3D Navigation in Comparison to 2D Navigation and Conventional Technique in Transilliosacral Screw Placement

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Introduction: In the last years there has been an increase in use of computer assisted surgery in transilliosacral screw placement. Until now there were no studies using the flatpanel technology. In the

presented study we investigated the effects of 3d navigation and flatpanel technology in transilliosacral screw placement.

Material and Methods: 99 cannulated screws were placed in 15 human semi-cadaver models and 9 plastic pelvis models in 3d navigated, 2d navigated and conventional Matta technique. Aim of this study was to evaluate intraoperative time, intraoperative radiation dose (fluoroscopy time, area dose product and images per screw) and accuracy (amount of exactly placed screws, mean deviation of tip placement and misplaced screws per group).

Results: The accuracy of 3d navigated procedures is significantly higher ($p < 0,05$) than in the conventional technique. There is a significant lower radiation dose in the navigated procedures ($p < 0,0001$) for the operation team. The intraoperative radiation dose is increasing significantly from conventional method to 2d navigated to 3d navigated procedures for the patient ($p < 0,01$). There is a significant higher time per screw necessary for navigated procedures ($p < 0,001$).

Conclusion: The usage of flatpanel technology seems promising in 3d navigation. Our data shows a benefit from using navigated procedures in transilliosacral screw placement. The higher precision and lower radiation exposure for the operation team show that 3d navigation is superior to 2d navigated procedures. The higher accuracy of the 3d navigated procedures renders a postoperative routine CT scan obsolete thus lessening the total radiation exposition of the patient.

Disclosure: No significant relationships.

BIOMECHANICS

M105 A Biomechanical Comparison of Two Different Types of Fixation, Screws and Pegs, for Distal Radius Fractures

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Introduction: The purpose of this biomechanical study was to determine whether locking screws or smooth locking pegs optimize fixation of AO A3 distal radius fractures.

Material and Methods: 8 pairs of fresh-frozen human distal radii were used. AO A3 extra-articular distal radius fractures were created by removal of a 1-cm-wide dorsal wedge of corticocancellous bone centered 2 cm from the articular margin of the distal radius and were fixed using palmar locking plates. The radii were divided into 2 matched-paired groups for comparison. The side order, the fixation order and the testing order were randomized. The distal fragment in group I was stabilized with 7 angular stable screws. The distal fragment in group II was fixed with 7 locking pegs. The proximal fragment in both groups was fixed with 3 screws. The probes were tested with 1.5 Nm for torsion and with 100 N axial load for 1000 cycles each. Stiffness was measured from the first 6 cycles regarding torsion and axial load. Then the differences of the stiffness were recorded during the remaining cycles. The Wilcoxon test was performed, a value of $p \leq 0.05$ was considered statistically significant.

Results: There were no statistically significant differences in the first 6 load cycles within the eight matched pairs. After 1000 cycles the constructs with locking screws (group I) showed statistically higher stiffness values ($p = 0.008$) compared to the constructs with smooth locking pegs (group II). The median stiffness values regarding torsion

for the first 6 cycles within group I were 10.8 Ncm/° (mean: 10.4 Ncm/°) and for group II 9.6 Ncm/° (mean: 10.1 Ncm/°). Under axial loading condition the median stiffness within group I was 193.1 N/mm (mean: 188.2 N/mm) and within group II it was 136.6 N/mm (mean: 163.3 N/mm). After 1000 cycles the median torsion stiffness remained at 99.1% (mean: 88.6%) for group I and at 90.1% (mean: 79.2%) for group II.

Conclusion: This biomechanical study showed a statistically significant difference between the locking screw and locking smooth peg configuration concerning the stiffness of the constructs after 1000 cycles. The use of locking screws as opposed to smooth locking pegs for AO A3 extra-articular distal radius fractures optimizes construct stability. Therefore locking screws should be preferred in osteosyntheses of AO A3 distal radius fractures.

Disclosure: No significant relationships.

M106 Biomechanical Comparison of Odontoid Plate Fixation Versus Odontoid Screw Fixation

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Introduction: Plate fixation of the odontoid process without C1-C2 arthrodesis appears to be a practicable option for the management of odontoid fractures that are not suitable for conventional screw fixation. Although previous biomechanical works have evaluated the effectiveness of different odontoid screw fixation techniques, no study has quantified the mechanical stability of odontoid fixation by a plate device. The purpose of this study was to measure the mechanical stability of odontoid plate fixation using a specially designed plate construct, and to compare the results to those after odontoid single- and double screw fixation.

Material and Methods: The second cervical vertebra was removed from fifteen fresh human spinal columns. The specimens were fixed to the experimental apparatus, with the load cell at the articular surface of the odontoid process. In a first test series, stiffness and failure load of the intact odontoid were measured. Type II odontoid fractures were created by 45° oblique extension loading at the articular surface of the odontoid process. Afterwards, the specimens were randomly assigned to one of the following three groups: In Group I (n = 5) the fractures were stabilized using a specially designed plate construct, in Group II the fractures were fixed using two 3.5 mm cortical screws, and in Group III we used one regular 4.5 mm cortical screw. In a second test series, stiffness and failure load of the stabilized odontoid fractures were assessed for comparison and statistical analysis.

Results: Group I (plate device) showed a significantly higher mean failure load than Group II and Group III. The mean failure load of Group I after fixation of the odontoid fracture was 84% of the mean failure load that was necessary to create a type II odontoid fracture, initially. Comparing Group II (double screw technique) and Group III (single screw technique), there was no significant difference regarding the mean failure load. In both groups the mean failure load after odontoid fixation was approximately 50%

of the mean failure load of the intact odontoid. Statistical analysis also revealed a significantly higher stiffness of the stabilized odontoid after plate fixation, than after single or double screw fixation.

Conclusion: Plate fixation of the odontoid process as an alternative procedure in certain fracture patterns provided a significantly higher biomechanical stability than the technique of odontoid screw fixation. Using a specially designed plate construct fixed with two cancellous screws into the body of C2 and an additional cortical screw inserted in the odontoid process, 84% of the original stability of the intact odontoid was restored. Single or double screw fixation of the odontoid only restored approximately 50% of the original strength.

Disclosure: No significant relationships.

M107 Dynamic and Rigid Spinal Column Implants Influence the Mobility of the Adjacent Level Segments under Load Conditions In Vitro

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Introduction: Both the rigid fixateur interne and dynamic implants such as interspinous spacers are used increasingly in the treatment of spinal canal stenosis. In contrast to the rigid implants, dynamic implants should influence the mobility of the adjacent level segments fewer and should contribute therefore to a protection of adjacent degeneration. The goal of the existing study is the evaluation of the mobility change of the adjacent segments after implantation of different interspinous spacers and a fixateur interne under load conditions in all three planes of motion. At the same time spacers are examined, which clearly differ regarding its implantation from percutaneous procedure to open implantation.

Material and Methods: 13 fresh humane cadaver lumbar spinal columns (L2-L5) were examined. The multisegmental motion behavior was tested in the spine tester under pure moments (7.5Nm) with and without load (follower load 400 N) in all three movement planes. The measurements of the spinal columns resulted intact, partially destabilized and after implantation of an implant in the segment L3/L4. Current spacer Aperius (Kyphon, Mannheim, Germany), in space (Synthes, Umkirch, Switzerland), X stop (Tikom, Fürth, Germany) and Coflex (Paradigm Spine, Wurmlingen, Germany), a Spacer prototype present in development as well as the dorsal instrumentation system Click'X (Synthes, Umkirch, Germany). The segmental range of motion was measured and the symmetry of the curves observed.

Results: Extension and flexion were not influenced of all implants significantly. All dynamic implants and also the rigid implant led to a significant increase of the mobility during side bending and rotation in the area of the adjacent segments. Concurrently the cephalad adjacent segment (L2/L3) showed a significantly higher mobility than the caudal adjacent segment (L4/L5).

Conclusion: Dynamic implants such as the interspinous spacer enlarge the mobility of the adjacent segments during side bending and rotation in a comparable size as the rigid implant. To this extent it is to be assumed that reinforced adjacent degeneration cannot be prevented by the use of the interspinous spacer substantially.

References: Lindsey DP, Swanson KE, Fuchs P, Hsu KY, Zucherman JF, Yerby SA. The effects of an interspinous implant on the kinematics of the instrumented and adjacent levels in the lumbar spine. *Spine* 2003 Oct 1;28(19):2192-7. Akamaru T, Kawahara N, Tim Yoon S, Minamide A, Su Kim K, Tomita K, Hutton WC. Adjacent segment motion after a simulated lumbar fusion in different sagittal alignments: a biomechanical analysis. *Spine* 2003 Jul 15;28(14):1560-6.

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M108 Biomechanical Aspects of Compressive Osteoporotic Vertebral Fractures

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Introduction: Osteoporosis is a systemic skeletal disease characterized by reduced bone mineral density and disrupted microarchitecture of bone tissue.

The most severe consequence of osteoporosis are osteoporotic fractures. These are mainly low-energy fractures, which anamnesticly, clinically and radiologically differ from fractures in healthy bone.

We tried to find the answer to a question, whether it is possible, that osteoporotic compression fractures are single events, or if they represent a gradual, progressive vertebral collapse in patients with osteoporosis. We evaluated the forces, necessary for vertebral fractures, regarding the bone mineral density.

Material and Methods: 14 cadaver vertebrae were isolated with the approval of ethics committee. We measured their bone mineral density and then subjected them to the stress-test. We used the computer-controlled hydraulic press and stress vertebrae to the fracture point and beyond, monitoring the deformation and the load. A sigma-epsilon diagram was constructed from the data.

Results: With the loading of vertebrae the pressure grew exponentially as a function of deformation to the breakage point. Then we observe a plateau of saw-like shape, which corresponded to the progressive vertebral collapse. Further deformation led to gradual compacting of vertebrae and we observed once again an exponential increase in pressure.

This bone compaction is therefore the first mechanisms of fracture repair. The saw-like plateau form suggests progressive collapse of vertical trabeculae and their jamming into the horizontal, which then with the increasing deformation and load also fail. A similar phenomenon can be observed in the collapse of buildings during the demolition. (The 9-11 phenomenon).

Conclusion: Unlike a high energy vertebral fractures, the osteoporotic fractures are presented as a gradual vertebral collapse. They take place parallel with the processes of bone reparation and remodeling. From this standpoint, osteoporotic fracture is unique. Vertebral collapse increases the bone mineral density in the broken vertebrae, what is observed radiologically and densitometrically.

References: [1] Smrkolj V, Komadina R et al. Gerontološka travmatologija. Grafika Gracer; 2004. [2] Smrkolj V et al. Kirurgija. Sledi; 1995. [3] Cornel CN, Lane JM, Poynton AR. Orthopedic management of vertebral and long bone fractures in patients with osteoporosis. *Clin Geriatr Med* 2003; 19: 433 – 455 [4] Brown SA, Rosen CJ. Osteoporosis. *Med Clin N Am* 2003; 87: 1039 – 1063 [5] Melton III JL. Epidemiology worldwide. *Endocrinol Metab Clin N Am* 2003; 32: 1 – 13 [6] Wehren LE. The epidemiology of osteoporosis and fractures in geriatric medicine. *Clin Geriatr Med* 2003; 19: 245 – 258 [7] Link TM, Majumdar S. Osteoporosis imaging. *Radiol Clin N Am* 2003; 41: 813 – 83

Disclosure: No significant relationships.

M109 Biomechanical Comparison of the Stability/Instability After Different Segmental Decompression Techniques at the Lumbar Spine: An In Vitro Study

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Introduction: In many clinical studies, the effect of different segmental decompression techniques leading to a destabilizing effect is described in the treatment of posttraumatic spinal canal stenosis. Biomechanical investigations to this subject are however scarce. Therefore we examined the hypothesis that the integrity of the posterior complex is impaired by decompression procedures.

Material and Methods: 14 fresh humane cadaver lumbar spines were examined. The different decompression techniques (flavectomy, undercutting, laminotomy with hemifacetectomy and transected dorsal supraspinal ligament) were undertaken respectively in the segment L3/4. The multisegmental motion behavior was tested in the spine tester under pure moments (7.5Nm) in all three movement plains. The range of motion was measured and the symmetry of the curves observed.

Results: The results showed that under flavectomy with undercutting no significant variation was to be proved, however in the more expanded laminotomy with hemifacetectomy larger movement sizes than in intact condition could be assessed. The transected dorsal supraspinal ligament changed the movement behavior clearly in the sagittal plain while in side bending and rotation no essential changes were detected. An effect on the movement of the adjacent level segments could not be assessed.

Conclusion: The integrity of the posterior complex is little influenced through negligible decompressions techniques. However removal of parts of the facets or simulated ruptured dorsal supraspinal ligaments clearly impaired the segment stability. The result of this investigation allows us to draw conclusions regarding that an isolated fracture of the spinous process lead to a considerable sagittal segmental instability.

References: Tai CL, Hsieh PH, Chen WP, Chen LH, Chen WJ, Lai PL. Biomechanical comparison of lumbar spine instability between

laminectomy and bilateral laminotomy for spinal stenosis syndrome - an experimental study in porcine model. BMC Musculoskelet Disord. 2008 Jun 11;9:84. Chen LH, Lai PL, Tai CL, Niu CC, Fu TS, Chen WJ. The effect of interspinous ligament integrity on adjacent segment instability after lumbar instrumentation and laminectomy—an experimental study in porcine model. Biomed Mater Eng. 2006;16(4):261-7.

Disclosure: No significant relationships.

M110 Biomechanical Comparison of Locking Plate Osteosynthesis vs. Intramedullary Nailing for the Fixation of Olecranon Fractures

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Introduction: Tension band wiring is the standard procedure to treat olecranon fractures. Symptomatic hardware prominence and migration of K-wires cause a high revision rate. Alternative fracture fixation devices were developed. The aim of this study was to evaluate the biomechanical stability of two new designed fracture fixation devices for the treatment of olecranon fractures in dynamic continuous loading.

Material and Methods: In eight pairs of fresh frozen cadaver ulnae simulated oblique olecranon fractures were created and stabilized using either a precontoured locking compression plate, or an intramedullary locking nail. The specimens were then subjected to continuous dynamic loading (from 25 to 200 N) performing a matched pairs comparison. The statistical differences of the displacement in the fracture gap was determined using the Wilcoxon-test.

Results: Non of the fracture fixation devices had significant advantages after 300 cycles of continuous loading according to the Wilcoxon-test concerning the parameter of loosening.

Conclusion: Both new implants show a good performance in stability concerning dynamic continuous loading for the simulation of 6 weeks of light physiotherapeutic training in cadaver upper extremities.

Disclosure: No significant relationships.

M111 Does Augmentation with SIS Ameliorate Outcome in Rotator Cuff Repair?

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Introduction: Human evidence on the use of SIS (swine intestinal submucosa) patches to reinforce rotator cuff repairs is scarce. To further evaluate its value we set up this trial.

Material and Methods: We performed a randomized, prospective, double blinded study evaluating the effect of the application of the

Restore orthobiological implant (Depuy Orthopaedics, Warsaw USA) on the functional and structural outcome of a standardized repair of medium to large, but reparable, rotator cuff defects, augmented with a Restore patch or not. Patients have been randomly assigned to receive standard repair augmented with the Restore implant or to receive non-augmented standard repair. As the repair procedure is exactly the same in both patient groups, and the implantation of the Restore implant does not necessitate any additional incision or measures, neither the patient nor the assessors are aware of the fact an implant has been used. The ethical committee of the University Hospitals Leuven has approved the study. All patients get full information and are enrolled in the screening program after written consent only. Clinical evaluation, both pre-operatively and at 6 months post-operative is performed by the same, independent physiotherapist trained in shoulder evaluation using the Constant score. Structural evaluation is performed by ultrasonography, performed by a radiologist specialised in musculoskeletal radiology and sonography. Unpaired two-tailed t tests, performed with Prism 5 software for Mac OSX, were used to compare the results of the scores in the control group with those in the xenograft group. Fisher exact tests were used to evaluate the significance of differences in the proportions of retears in the patients for whom a sonography was obtained. Results are expressed as the mean and standard error and significance was set at $p < 0.05$.

Results: We included 20 patients. There were 7 female and 13 male patients. In the non-augmented group there were 3 females and 7 males. In the Restore group there were 4 female and 6 male patients. The average age of patients was 66 years of age. In the non-augmented group the average age is 65.2y (+/- 2.7) years of age, in the Restore group 66.8y (+/- 2.2). The mean pre-operative Constant score of the non-augmented group was 46.8 +/- 6.2 points whereas it was 42 +/- 5.6 points for the Restore augmented group. Post-operative The functional outcome 6 months after surgery again was scored using the Constant score. The mean score in the non-augmented group was 86 +/- 4.0 points; in the Restore group it was 82.1 +/- 4.5 points. In the non-augmented group we documented a re-tear in 1/10 patients, in the Restore group we had a re-tear in 3/9 patients (2 small tears, 1 massive tear).

Conclusion: No benefit of patch augmentation could be demonstrated. So we would like to conclude that we cannot recommend the use of a SIS-patch to augment a rotator cuff repair in the indications described above.

Disclosure: This study has been sponsored by Depuy orthopaedics

M112 Mechanical Suitability of Extracellular Matrix Grafts to Augment Repairs of Rotator Cuff Tears

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Introduction: It has been estimated that up to 30% of adults suffer from rotator cuff tears [1], which can impair their ability to work or perform household tasks [2]. Management of rotator cuff tears is difficult as a large proportion of technically correct surgical repairs re-rupture, estimated between 13-68% [3]. It has been

estimated that thousands of extracellular matrix repair grafts are used annually [4] to augment surgical repair of rotator cuff tears and act as temporary scaffolds to support tendon healing. The only mechanical assessment of the suitability of these grafts for rotator cuff repair has been made using tensile testing only, and compared grafts to canine infraspinatus [4]. As the shoulder is subject to shearing as well as uniaxial loading, we compared the response of repair grafts and human rotator cuff tendons to shearing mechanical stress. We used dynamic shear analysis (DSA), which is a form of rheology and allows the study of flow and material deformation.

Material and Methods: The shear properties of four different commercially available rotator cuff repair grafts were measured (Restore, GraftJacket, Zimmer Collagen Repair and SportsMesh). 3 mm punch biopsies were taken from the grafts and subjected to oscillatory deformation under compression. The bulk storage modulus (G') was calculated [5] and used as an indicator of mechanical integrity. To assess how well the repair grafts were matched to torn and normal rotator cuff tendons, the storage modulus was calculated for 79 human rotator cuff specimens obtained from the edge of rotator cuff tears during surgery, from patients aged between 22 and 89 years. 14 age and sex matched normal controls were also obtained during shoulder hemiarthroplasties and stabilisations.

Results: We report a significant difference in the shear moduli of all four rotator cuff repair grafts ($P < 0.001$, 1 way ANOVA). 2 of the repair grafts (Restore and GraftJacket) had a significantly lower storage modulus when compared to human rotator cuff tendons ($P < 0.01$, Dunn's multiple comparison test). Only the Zimmer Collagen Repair and SportMesh had a storage modulus which was comparable to that of normal rotator cuff tendons ($P > 0.05$), and thus were most closely matched.

Conclusion: With increasing numbers of repairs of rotator cuff tears, and augmentation of these repairs, there is a need to understand the mechanical and biological properties of the both repair grafts and the tendons they are designed to augment. There is no clear definition of the ideal mechanobiological properties. Current rotator cuff repair grafts display a wide variation in their shear mechanical properties, and how closely they are matched to the mechanical properties of human rotator cuff tendons. It is hoped that this study, in conjunction with others, will help to guide surgeons in deciding on the most appropriate repair graft.

References: [1] Lehman, C., et al., The incidence of full thickness rotator cuff tears in a large cadaveric population. *Bulletin: Hospital for Joint Diseases*, 1995. 54(1): p. 30-31. [2] Van Der Windt, D.A.W.M., et al., Occupational risk factors for shoulder pain: A systematic review. *Occupational and Environmental Medicine*, 2000. 57(7): p. 433-442. [3] Jost, B., C.W.A. Pfirrmann, and C. Gerber, Clinical outcome after structural failure of rotator cuff repairs. *Journal of Bone and Joint Surgery - Series A*, 2000. 82(3): p. 304-314. [4] Derwin, K.A., et al., Commercial extracellular matrix scaffolds for rotator cuff tendon repair - Biomechanical, biochemical, and cellular properties. *Journal of Bone and Joint Surgery-American Volume*, 2006. 88A(12): p. 2665-2672. [5] Subbotin, A., et al., Nonlinear rheology of confined polymer melts under oscillatory flow. *Macromolecules*, 1996. 29(4): p. 1296-1304.

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KNEE

T001 2D and 3D-computed Tomography for the Classification and Characterization of Tibial Plateau Fractures

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Introduction: Complex fractures of the tibial plateau can be difficult to characterize on plain radiographs and two-dimensional computed tomography scans. We tested the hypothesis that three-dimensional computed tomography reconstructions improve the reliability of tibial plateau fracture characterization and classification.

Material and Methods: Forty-five consecutive intra-articular fractures of the tibial plateau were evaluated by six independent observers for the presence of six fracture characteristics that are not specifically included in currently used classification schemes: (1) posteromedial shear fracture; (2) coronal plane fracture; (3) lateral condylar impaction; (4) medial condylar impaction; (5) tibial spine involvement; (6) separation of tibial tubercle necessitating antero-posterior lag screw fixation. In addition, fractures were classified according to the AO/OTA Comprehensive Classification of Fractures, the Schatzker classification system and the Hohl and Moore system. Two rounds of evaluation were performed and then compared. First, a combination of plain radiographs and two-dimensional computed tomography scans (2D) were evaluated, and then, four weeks later, a combination of radiographs, two-dimensional computed tomography scans, and three-dimensional reconstructions of computed tomography scans (3D) were assessed.

Results: Interobserver agreement improved for all classification systems after the addition of three-dimensional reconstructions (AO/OTA $\kappa_{2D} = 0.536$ versus $\kappa_{3D} = 0.545$; Schatzker $\kappa_{2D} = 0.545$ versus $\kappa_{3D} = 0.596$; Hohl and Moore $\kappa_{2D} = 0.668$ versus $\kappa_{3D} = 0.746$). Three-dimensional computed tomography reconstructions also improved the average intraobserver reliability for all fracture characteristics, from $\kappa_{2D} = 0.624$ (substantial agreement) to $\kappa_{3D} = 0.687$ (substantial agreement). The addition of three-dimensional images had limited influence on the average interobserver reliability for the recognition of specific fracture characteristics ($\kappa_{2D} = 0.488$ versus $\kappa_{3D} = 0.485$, both moderate agreement). Three-dimensional computed tomography images improved interobserver reliability for the recognition of coronal plane fractures from fair ($\kappa_{2D} = 0.398$) to moderate ($\kappa_{3D} = 0.418$) but this difference was not statistically significant.

Conclusion: Three-dimensional computed tomography is helpful for: 1) individual orthopaedic surgeons for preoperative planning (improves intraobserver reliability for the recognition of fracture characteristics), and for 2) comparison of clinical outcomes in the orthopaedic literature (improves interobserver reliability of classification systems).

Disclosure: No significant relationships.

T002 Radiation Exposure During Intraoperative 3D C-Arm Image Intensifier Application of the Knee: An Experimental Study

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Introduction: In recent years, 3D fluoroscope has used increasingly in orthopaedic surgery because it offers some advantages such as generation 3D data without anatomic registration requirement. Previous studies have focused on the clinical use of 3D fluoroscope in surgical procedures such as calcaneus or acetabular fracture reduction, or placement of screws in spinal surgery. There are no reported data on radiation exposure of 3D flu to orthopaedic theater staff.

We want to correlate radiation exposure and distance concerning the patients and members of surgical team during using three-dimensional fluoroscope and study how far is enough until radiation exposure can not be measured.

Material and Methods: An isocentric C-arm fluoroscope (Siremobile IsoC 3D) was used for the study. Human cadaveric extremity was used for target. Digital dosimeters (MYDOSE mini PDM-117, Aloka) were used to measure radiation exposure at specific distances. Dosimeters were systematically exposed by the following protocol. Represented positions were direct contact and every 25-cm. radius from the center of the beam. The distances were increasing until the dosimeters could not detect the radiation. Each radius distances were designed to record 4 different positions; top, bottom, left and right side. Dosimeters were exposed and removed (4 dosimeter positions at a time from each radius). First we used low resolution scan technique to obtain the images. After all radiation exposure records were collected, we changed to use high resolution scan technique and repeated the protocol. Each technique was repeated in 3 times to obtain the mode of data.

Results: Radiation dose at ground zero is 49 µSv in high resolution and 21 µSv in low resolution. Radiation in high resolution technique can not be measured beyond 1 meter from the center of the beam at the top, bottom, and right direction and 1.5 meters at the left direction. In low resolution, radiation cannot be detected farther than 75 cm. in the top, bottom and right direction and 1.25 meters at left direction.

Conclusion: Radiation dose measurements in each direction are decreased during increasing distance and dose in left direction is higher and farther than others. Beyond 1.5 meters is safe from radiation in knee application. High resolution gives higher radiation and farther than low resolution.

References: 1. Atesok K, Finkelstein J, Khoury A, et al. The use of intraoperative three-dimensional imaging (ISO-C-3D) in fixation of intraarticular fractures. *Injury, Int. J. Care Injured.* 2007;38:1163-9. 2. Kendoff D, Gardner M, Citak M, et al. Value of 3D fluoroscopy imaging of acetabular fractures comparison to 2D fluoroscopy and CT imaging. *Arch Orthop Trauma Surg.* 2008 Aug;128:599-605. 3. Linsenmaier U, Rock C, Euler E, et al. Three-dimensional CT with a modified C-arm image intensifier: feasibility. *Radiology* 2002;224:286-92.

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T003 Associated Soft Tissue Complications in Tibia Plateau Fractures

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Introduction: The purpose of this study was to analyze associated complications in tibia plateau fractures in relation to the fracture type (dislocation- or non-dislocation-type) and treatment policy (one- or two-staged)

Material and Methods: Over an 8-year period, prospectively acquired data of 364 tibia plateau fractures were evaluated. All fractures were classified either according to the Moore (fracture dislocation types) or to the AO/OTA-classification system respectively. The appearances of associated complications i.e. compartment syndrome (CS) and surgical site infection as well as treatment modality i.e. one- or two-staged (initial knee-spanning external fixator) procedures were analyzed.

Results: Of all 364 fractures, 49 (14%) were classified as dislocation type (Moore I-V) and 315 (86%) as Non-Moore type fractures. Non-Moore type fractures were mainly classified as B3 (119) and C3 (75) according to the AO/OTA classification system. 105 fractures (most Moore-type and C3-type fractures) were treated in a two-staged procedure with initial external fixator and definitive reconstruction after in average 6.2 days. Overall 34 (9%) compartment syndromes occurred. All were diagnosed and treated within the initial surgical management. It was not more common in dislocation type fractures (6/49) than in Non-Moore type fractures 28/315 (chi-square test, $p = 0.5$). There was also no significant difference between Moore type and C3 type fractures (19/75) (chi-square test, $p = 0.14$). But there was a high significant difference between B type Non-Moore type fractures (0/166) and all other fracture types (34/198) (chi-square test, $p < 0.005$). Postoperative surgical site infection remained very low with 0.5% and was not related to the staged procedure.

Conclusion: Compartment syndrome is a common complication in high energy tibia plateau fractures (Moore- and C3 type) on one hand, but it is extremely rare in the most common B type fractures. The two-staged procedure with initial knee-spanning external fixator can prevent the delayed occurrence of a compartment syndrome. Conversion to the definitive internal fixation within the first 10 days does not increase the risk of a postoperative surgical site infection.

Disclosure: No significant relationships.

T004 The Proximal Tibia Joint Fracture as an Increasing Injury in Skiing. Early Results of a Prospective Study

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Introduction: Since the introduction of carving skis, the injuries of the tibia is changing from simple fractures of the diaphyse to complex fractures of the epiphyses, according to high energy traumas. There are no studies about results of the treatment and consequences after winter sport accidents.

Material and Methods: Prospective documentation of all proximal tibia fractures after winter sport accidents, which were treated between 01.12.2006 and 31.04.2009 in the Trauma Department of the Klinikum Garmisch-Partenkirchen, Germany. X-Rays and CT scans were classified according to the AO –Classification. Operations, complications, co-injuries and the hospital stay were analysed. We performed the Lysholm score, WOMAC Knee-score and the Tegner-index on the day of injury, 6 months, 12 months, and 2 years after injury.

Results: 78 patients had a proximal tibia fracture following a skiing accident, 36 Male and 43 female. All except two patients had a mono-trauma of the proximal tibia. Mean age 46 ± 15 years. 17 types A.1.3, 41 types B and 18 types C3 fractures. 4 patients developed a compartment syndrome, one patient had a lesion of the n. peroneus. 65 patients were operated in our hospital. In 8 patients we performed a conservative treatment. The mean hospital stay was 12 ± 7.5 days. In 15 patients a menisci reconstruction was necessary. 6 patients had a postoperative complication: 3 thromboses, 2 cardiac decompensations, 1 wound healing problems. By now 42 patients were ready for follow-up. So far the mean follow-up time is 13.8 months. The Lysholm score was at 12 months ($n = 22$) 78 ± 20 points. The Tegner score was pre-injury 6.2 ± 1.1 and 12 months post-injury 4.1 ± 1.8 . The results of the WOMAC score show an improvement in the subcategories pain and function in all patients. In the subcategory stiffness only the type A and B fractures show an improvement during the follow-up.

Conclusion: The proximal tibia joint fractures are a serious injury. The most patients' activity level is tremendously reduced. The major problem after one year seems to be the ligament instability of the knee. A beginning knee arthritis after one year becomes relevant only in the type C fractures. More effort for the prevention of the proximal tibia fractures while skiing is necessary.

References: Deibert, M. C. "Skiing injuries in children, adolescents, and adults." (1998). Freeman, J. R. "Changing patterns in tibial fractures resulting from skiing." (1987). Grutter, R. "The epidemiology of diaphyseal fractures of the tibia." (2000). Schneider, T. "Snow skiing injuries." (2003). Sullivan, D. J. "Natural history of a type III fracture of the intercondylar eminence of the tibia in an adult. A case report." (1989).

Disclosure: No significant relationships.

T005 The Less Invasive Stabilisation System (LISS) in the Treatment of Tibial Plateau Fractures with Impression: Radiological Results

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Introduction: Tibial plateau fractures with impression are often associated with poor outcomes and a high rate of complications. The current guidelines advocate anatomic reduction, re-establishment of tibial alignment, stable fixation, and filling of the sub-articular defect. We hypothesized that fixed-angle LISS-plates provide adequate stabilization with less need for void filling, minimal complications and good radiological outcome.

Material and Methods: Retrospective evaluation study. In the period 2004-2008, we operated 55 patients with an intra-articular tibial plateau fracture. Forty were treated with a LISS-plate. Mean age was 57 years, 14 were male. All fractures were classified as AO type B or C; 16 were Schatzker type II, 2 type IV, 2 type V, and 20 type VI. Five patients were initially treated with external fixation. Mean time until definitive surgery was 9 days (range, 1 - 47 days). In 12 fractures, the subchondral void was filled with either hydroxy or bone graft, in the other 28 cases no graft was used. Demographic data and fracture classification were equal in both groups. Articular impression was measured by 3 independent evaluators pre-operatively, post-operatively and 6 months after surgery on plain X-rays.

Results: Mean pre-operative impression was 6.9 mm (with void filling 8.0 mm, without 6.5 mm, ns). Thirty-four fractures were additionally stabilized with K-wires or screws. The post-operative impression was on average 2.8 mm. After 6 months, there was a mean subsidence of 0.6 mm. There was no difference in subsidence in case the subchondral void was filled or not. Dislocation and varus/valgus malalignment of the tibial plateau was corrected and remained stable in all but one case due to remaining subluxation. Eleven (28%) patients had 15 post-operative complications, of which 8 were local (superficial wound infection 4, deep infection 3, malposition 1). In 6 (15%) patients the plate was removed (deep infection 2, persisting pain or other reasons 4).

Conclusion: LISS-plates provide good fixation and stabilization of intra-articular tibial plateau fractures. We have indication that filling of the subchondral void is unnecessary in preventing subsidence of the articular surface in these unstable fractures.

References: 1. Honkonen SE, Järvinen MJ. Classification of fractures of the tibial condyles. *J Bone Joint Surg Br.* 1992 Nov;74(6):840-7. 2. Stevens DG, Beharry R, McKee MD, Waddell JP, Schemitsch EH. The long-term functional outcome of operatively treated tibial plateau fractures. *J Orthop Trauma.* 2001 Jun-Jul;15(5):312-20. 3. Jiang R, Luo CF, Wang MC, Yang TY, Zeng BF. A comparative study of Less Invasive Stabilization System (LISS) fixation and two-incision double plating for the treatment of bicondylar tibial plateau fractures. *Knee.* 2008 Mar;15(2):139-43. Epub 2008 Jan 24

Disclosure: No significant relationships.

T006 Operative Strategy in Medial Condylar Fracture-Dislocations of the Proximal Tibia

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Introduction: In 1980 Moore¹ introduced a new classification for dislocation type fractures caused by high energy mechanisms. The most common medial Moore type fractures are entire condyle fractures with the avulsion of the median eminence. They are usually associated with a posterolateral depression of the tibial plateau and an injury of the lateral meniscotibial capsule. This uniform injury of the knee is increasingly observed in the recent years after skiing injuries due to the high speed carving technique. The aim of this study is to describe the injury pattern, our operative approach for reconstruction and outcome.

Material and Methods: All patients with medial Moore type fracture from 2001 until 2009 were analyzed retrospectively. Clinical and radiological Follow-up was performed with a minimum of one year. Evaluation criteria included the Lysholm and Tegner Activity Score. All fractures were stabilized post primarily. The surgical main approach was strictly medial. Exposure of the entire medial condyle fracture was first performed anteromedial following the fracture line to the articular border. The posterolateral impaction was addressed directly through the main fracture gap. Small fragments were removed, larger reduced and preliminarily fixed with separate K-wire(s). The posteromedial part of the condyle was then prepared for main reduction and application of a buttress T-plate in a postero-medial position, preserving the pes anserinus and medial collateral ligament. In addition a parapatellar medial mini- arthrotomy through the same main approach was performed for reduction and PDS-suture-fixation of the anterior eminence (ACL and anterior horn of lateral meniscus).

Results: We treated 28 patients with 29 fractures. Median age was 48 years (20-77). We could evaluate 25 patients (89%), 3 patients were lost to follow-up due to foreign residency. The fractures were treated post primarily at an average of 4 days, 18 of them in a two-staged procedure with initial knee-spanning external fixator. All fractures healed without secondary displacement or infection. 24 patients showed none to moderate osteoarthritis after a median of 4 years. One patient showed a severe osteoarthritis after 8 years. All patients judge the result as good to excellent. The Lysholm score reached 95 (75-100) and the Tegner Activity Score 4 (3-7). All patients have achieved a minimum flexion of 100°.

Conclusion: In our view it is crucial to recognize this increasingly observed type of knee injury in winter sport areas. With our strategy we achieved good results in nearly all patients. The described larger medial approach allows addressing most of the injured parts of the tibial head (medial condyle with posteromedial buttressing, tibial spine, posterolateral impaction).

References: 1 Fracture-Dislocation of the Knee, 1980, Tillman M. Moore, MD

Disclosure: No significant relationships.

T007 Causes, Treatment and Results Following Floating Knee Injuries

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Introduction: Floating knee injuries have a low incidence and are mostly caused by high deceleration trauma. To evaluate pathogenesis, treatment and clinical long term results we retrospectively investigated floating knee injuries in our Level-I Trauma Center.

Material and Methods: We identified patients with a floating knee injury treated in our trauma centre between January 1999 through

July 2007. Records were analyzed for causes and treatment. Patients were invited for a physical examination to evaluate long term results.

Results: 63 patients (44 males, 17 females) were included. The mean age was 35.9 ± 1.9 years. All injuries were due to motor vehicle accidents. 52 patients had associated injuries with an injury severity score of 23.8 ± 1.5. Relevant vascular injuries were apparent in 15 patients. 27 patients had a type I injury, 34 patients suffered from a type II injury (IIA: 12, IIB: 8, IIC 14) following the Fraser classification. 7 patients were amputated due to severe soft tissue damage. Definitive treatment was achieved after 4.4 ± 0.4 surgical procedures. Non-unions were seen in 7 patients (femur: 4, tibia: 3). 26 patients had superficial and 11 patients had deep infections. 22 patients developed a compartment syndrome of the lower leg. 19 patients had poor outcome using the the Lysholm score while only 7 patients had an excellent outcome (Good: 7, Fair : 5).

Conclusion: The floating knee injury is a rare injury mostly caused by motor vehicle accidents. Relevant vascular injuries and the development of a compartment syndrome must be considered concerning surgical treatment. Although adequate surgical treatment is performed patients suffer from poor outcome.

Disclosure: No significant relationships.

T008 Minimally Invasive Approach to Metaphyseal Lesions of the Lower Extremity

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Introduction: Metaphyseal lesions of lower extremities are big challenge of trauma surgeons. Today metaphyseal fractures are ordinary comminuted and opened. Soft tissues are frequently affected and end results are dependent of soft tissue management. Minimally invasive surgery is very desirable in the treatment of these fractures.

Material and Methods: It is presented one new minimally invasive method for closed fracture reduction and one extramedullary self-dynamisable internal fixator (SIF). There is no contact between bone and internal fixator in fracture area. It has been widely investigated biomechanically. In clinical use it has been applied to 119 metaphyseal fractures of distal femur and proximal and distal tibia. The age of patients was from 18 to 86 years. This internal fixator is applied by two small incisions. Reduction is achieved using standard traction table or using special reduction device. For opened fracture it has been used high mobile external fixation system as temporarily (39 fractures) or definitive (49 fracture) method.

Results: Received clinical results are promising, as it has been shown early callus formation and radiological union within the 2.5-4 months. It has been allowed to patients early full weight bearing, if fractures not intraarticular. During the treatment it has been confirmed working of self-dynamisation concept, which probably all together with 3D configuration resulted in unexpectedly quick fracture healing. Follow up was 19 months (6-60). When used external fixation system, axial dynamisation has been regularly activated.

Conclusion: According to results obtained, it can be concluded that new biological internal fixator is suitable for minimally invasive technique, without opening of fracture site if no intraarticular dislocation. It can be used as primary method or soon after external fixation if damaging control concept used.

References: 1. M. Mitkovic, M. Bumbasirevic, Z. Golubovic, D. Mladenovic, S. Milenkovic, I. Micic, A. Lesic, V. Bumbasirevic, P. Pavlovic, S. Karalejic, G. Kuljanin, D. Petkovic, K. Abdala, Recon-structive procedures on lower extremities using Mitkovic external fixation system, *Acta Chir Iugosl*, 52(2005)117 2. M. Mitkovic, M. Bumbasirevic, Z. Golubovic, D. Mladenovic, S. Milenkovic, I. Micic, A. Lesic, V. Bumbasirevic, P. Pavlovic, S. Karalejic, G. Kuljanin, New biological method of internal fixation of the femur, *Acta Chir Iugosl*, 52(2005)113 3. M. Mitkovic, M. Bumbasirevic, Z. Golubovic, I. Micic, D. Mladenovic, S. Milenkovic, A. Lesic, V. Bumbasirevic, P. Pavlovic, S. Karalejic, G. Kuljanin, D. Petkovic, New concept in external fixation, *Acta Chir Iugosl*, 52(2005)107 4. M. Mitkovic, I. Micic, D. Mladenovic, Z. Golubovic, M. Bumbasirevic, S. Karalejic, M. Mitkovic, Closed fracture reduction using motorized remote controlled reduction device, *Biotechnol & Biotechnol Eq*, 20(2006)210.

Disclosure: No significant relationships.

DISASTER & MILITARY SURGERY

T009 The Impact of the Emergency Department's Proper Architectural Design In Management of Disaster Situations in Greece

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Introduction: Disaster, is the disproportion between the need for medical care and the means available in the community. This discrepancy of needs /means is the major problem in every step of the Rescue Chain, when a disaster situation is present. This is more obvious at the end of the Chain, which is the Hospital and especially, the bottleneck of the entire disaster's management system, the Emergency Department.

Material and Methods: In Greece, the most common and frequent disaster situation is the earthquake. And so, the most expected pathology of the victims is trauma. Because of the lack of 1. special organization of Emergency Medicine and 2. independent modern Emergency Departments in greek Hospitals, their directors did not give the appropriate attention to organize a disaster plan (internal or external).

Results: A disaster plan, should mainly be defined by the internal and external design of the Hospital. And because of the inflexibility of the hospital's main structure and of course, because of the central position (as a hospital's gate) of the Emergency Department, the solution is to design from the beginning an ED with an internal structural flexibility.

Conclusion: This study emphasizes on the evolution of the architectural design of the Emergency Department of the greek hospitals, through the last 120 years and its impact on the

management of a disaster. At the end of this presentation a new model of ED especially designed to manage disaster situations, is presented.

Disclosure: No significant relationships.

T010 Experiences from a New Simulation Model Designed both for Training and Evaluation of Methodology in Major Incident Response

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Introduction: Accurate response to major incidents requires accurate decisions on all levels, from command level to the care of the individual patient. Development, evaluation and training of the process of decision-making requires standardized models providing complete and accurate information as a base for the decisions; a decision based on incomplete or incorrect data can not be properly evaluated. The aim of the present project was to design a simulation model that could be used both for evaluation of different methods in the response to major incidents and for training and evaluation of skills in making correct decisions.

Material and Methods: A system was created providing the information required for this process in the whole chain of management and performance: Scene, transport, hospital response, co-ordination and command. Input data were based on real scenarios and real resources. For evaluation of methodology, all parameters except the one studied, in this study triage, were standardized. The results from (a) physiological and (b) anatomical triage, performed by staff on different levels of competence and experience, serving as their own controls, were compared. For training, the system was used in courses in medical response to major incidents with training of the whole chain of management and performance, from prehospital patient management to over all co-ordination and command.

Results: The methodological evaluation showed differences in priority and outcome between anatomical and physiological triage related to the level of experience and to the position in the chain of response, providing a base for choice of method related to those factors. The results from training with the use of the system, so far only evaluated by the participants own ranking, showed high perceived improvement of relevant skills.

Conclusion: A methodology for simulation of major incident response designed for scientific evaluation of methodology also provides a very good educational tool, since correct and complete data as a base for decision making also gives an effective and realistic training.

Disclosure: One of the authors, SL, has the copyright to the MAC-SIM system, a non-commercial system intended mainly for scientific use. Equipment for training can be produced by users, but also purchased for production costs.

T011 Surgical and Advanced Procedures on a Regional Air Ambulance in the United Kingdom

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Introduction: Air ambulances traditionally operate with paramedics who do not perform advanced invasive procedures. Life threatening injuries demanding such interventions require immediate action. This study observed current practice of invasive procedures on a regional doctor-led air ambulance to identify training and service requirements.

Material and Methods: Mission data was recorded prospectively and the database interrogated to identify invasive procedures (surgical airway; thoracostomy; chest drain insertion; major venous/intraosseous access; thoracotomy; amputation) over a 64 month period. Indication, morbidity and mortality outcomes, and mechanism of injury were assessed.

Results: 166 procedures were performed: 10 (6%) for injuries affecting airway, 75 (45%) for breathing, and 81 (49%) for circulation. Doctors performed 89% of the procedures and paramedics the remainder. Ninety three patients entered cardiac arrest during the pre-hospital phase, of whom 30 (32%) regained spontaneous circulation possibly as a direct result of the intervention. Seventy three (44%) died or were pronounced dead at scene, and 93 (56%) were conveyed to hospital alive.

Conclusion: Our study demonstrates the need for and potential benefit of appropriately trained air ambulances doctors. Training doctors for this purpose presents a challenge given the background of the majority of prehospital doctors; mixed doctor crews incorporating a surgeon would be a solution.

Disclosure: No significant relationships.

T012 Vital Sign Abnormalities as a Part of the Pre-Hospital Assessment of Trauma Patients

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Introduction: We showed that the SIRS scores at the time of arrival to the hospital increased with increasing anatomical and physiological severity of the trauma in trauma patients. These findings suggested the usefulness of measurement of the vital signs for predicting trauma severity. On the other hand, accurate pre-hospital triage of trauma patients still remains difficult.

Material and Methods: Hospital data from the Japan Trauma Data Bank of 530 consecutive trauma patients with AIS scores of <2 who were analyzed. The relationships between the vital signs (systolic blood pressure (SBP) < 90 mmHg, heart (HR) > 90/min, respiratory rate (RR) > 20/min.) in the pre-hospital setting and the trauma severity (ISS, RTS and probability of survival; Ps) were determined. The patients were separated into two groups for the analysis: a group

composed of patients with more than two abnormal vital signs (positive group; 262 cases) and a group with no vital sign abnormalities (negative group; 268 cases).

Results: The mean age of the 530 patients was 47.0 ± 22.4 years, males accounted for 75.3% of all patients and females for 25.7% of patients, and the type of trauma was penetrating in 4.5% of the patients and blunt in the remaining 95.5% of the cases. The underlying injuries included head injury (26.3%), chest injury (21.8%), abdominal injury (10.3%), severe extremity injury (34.0%), etc. Patients with abnormal SBP showed significantly higher ISS and lower RTS /Ps, and those with abnormal HR and RR showed significantly higher ISS. The positive group showed significantly poorer outcomes ($p = 0.0044$), with significantly higher ISS (21.3 ± 14.2 vs 16.3 ± 10.0 ; $p < 0.0001$), lower RTS (6.890 ± 1.605 vs 7.233 ± 1.384 ; $p = 0.0123$), and low Ps value (0.846 ± 0.257 vs 0.900 ± 0.203 ; $p = 0.0107$) at the time of arrival of the emergency medical technician.

Conclusion: Prehospital vital signs can be considered as valuable supplementary indicators of the trauma severity for field triage.

References: American College of Surgeons Committee on Trauma: Resources for optimal care of the injured patient, Chicago, 1999. 8. Napolitano LM, Ferrer T, McCarter RJ Jr, et al. Systemic inflammatory response syndrome score at admission independently predicts mortality and length of stay in trauma patients. *J Trauma*. 2000;49:647-653. Miller PR, Munn DD, Meredith JW, Chang MC. Systemic inflammatory response syndrome in the trauma intensive care unit: who is infected? *J Trauma*. 1999;47:1004-1008 10. Hoover L, Bochicchio GV, Napolitano LM, et al. Systemic inflammatory response syndrome and nosocomial infection in trauma. *J Trauma*. 2006;61:310-317.

Disclosure: No significant relationships.

T013 Early Interhospital Referral of Polytraumatized Patients: Almost One Third of Patients are Incompletely Assessed Initially.

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Introduction: Interhospital referral of traumapatient for reasons of special (most neuro-)surgical competencies to a specific Level 1 traumacenter, is common practice in the Netherlands. These traumapatient are sometimes admitted directly through specialized intensive care units and therefore do not enter the Emergency Department (ED). Therewith the standard assessment according to the ATLS guidelines is bypassed in these cases. This withholds the risk of an incomplete assessment. We therefore consistently coordinate the assessment of all transferred traumapatient. In this study we analysed the number of newly found injuries in referred polytraumatized patients and the clinical consequences in terms of extra treatment, permanent damage or death to the patient. We also analysed possible risk factors for missing injuries.

Material and Methods: Retrospective study of 154 trauma patients with ISS > 16 who were transferred to our level I hospital within 48 hours from the original trauma. To define any new diagnosis and its impact on the patient, the list of injuries from the referring hospital was compared to the list of injuries that was concluded in our hospital. For the risk analysis we tested several items for significant influence on missing injuries.

Results: Out of 154 patients, 44 patients were not completely diagnosed (88 “new” injuries). Musculoskeletal injuries were responsible for the largest number of newly found injuries, followed by pulmonary and neurological injuries. Consequences were generally limited in terms of (operative) treatment, although some potentially life threatening injuries were found (tension pneumothorax, disruption of subclavian artery, splenic rupture). Most of the patients (39/44) were treated by extra consultation immobilization and only 5 patients required extra operative treatment (5/44). GCS was significantly lower in patients with missed injuries (mean 10.2 SD \pm 5.0, $p = 0.01$).

Conclusion: Interdisciplinary hospital transfer of traumapatient withholds the risk of an incomplete assessment. Therefore, transferred traumapatient should consistently be admitted through the ED and receive a renewed full standard “primary” assessment.

References: Missed injuries; polytrauma; transferred patients; inter-hospital referral; risk factors

Disclosure: No significant relationships.

T014 Management of Patients' Admission at the Hospital Entrance During Emergency Situations

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Introduction: Synchronous admission of large numbers of patients into the hospital requires a perfect coordination of activities of designated teams in the process of reclassification at the entry to the hospital and subsequent continuous provision of medical care for the patient in the course of examination and treatment, up to his hospitalisation at the target department, in accordance with the characteristics of the injury and seriousness of his medical condition. This process cannot be accomplished through improvisation but only with creating a uniform organisational scheme, defining the recommended structure of medical teams and their activities during a multiple admission of casualties into the hospital. In this article, we present a proposal of such consensual organisational scheme, partially verified in practice.

Material and Methods: The organisational scheme is defined in the following areas: - space arrangements - places of admission and organisation of work - creation of mini trauma teams (anaesthesiologist, traumatologist and surgeon or another traumatologist take over the most serious patients, the teams are accompanied by consulting specialists of relevant specialities (neurologist, neurosurgeon, radiologist), the whole teams or at least parts of them, accompany the patients for the whole period up to the definite treatment at operating theatre, or his placement at a destination department – the

continuity of care is secured in this way, without the need to pass on any findings and information - placement of patients into individual hospital departments (follows certain rules, it is necessary to direct all the admitted patients into as few departments as possible (one or two), and thus keep the best possible view over the priorities during their treatment - entry corridors - „green corridor” – patients are immediately transported through this area by transport teams into the “green” designated area, the “red” and “yellow” entry area does not have to be extremely large, however it requires an adequate equipment from the material and technical point of view

Results: Multiple admission of patients must be well-organised and managed, most often by a head-physician of the UA department, or another authorised specialist (in hospitals without the UA department).

Conclusion: The proposed organisation scheme should apply to the maximum extent situations of multiple admission of patients in any type of medical facility. It is necessary to apply and modify the proposed system depending upon the layout and staffing of the individual hospital.

References: Pokorný J. et al. Urgentní medicína, 1st Edition: Praha: Galén; 2004 Stetina J. et al. Medicína katastrof a hromadných nestěstí, 1st Edition: Praha: Grada; 2000 Paterson-Brown S. Emergency Surgery and Critical Care, 1st Edition: London: WB Saunders Company Limited; 1997

Disclosure: No significant relationships.

T015 Traumanetwork of the DGU. Implementation of a Nationwide Network for the Treatment of Severely Injured Patients

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Introduction: Despite the fact that the quality in treatment of severely injured patients is high, in 2006 the German Society for Trauma (DGU) initialised the project “TraumaNetwork^D DGU”. The idea of the TraumaNetwork^D DGU is to build up regional networks of various trauma centers with the objective to standardise and optimise the treatment of severely injured patients - with the additional involvement of rescue services, physicians and competent facilities and centres for the treatment of specific injuries as severe burn or spinal cord injuries etc. To assure that all participating hospitals meet the criteria needed for the treatment of trauma patients, a certification firm (DIOcert) was assigned to accomplish the audits and to control the process of certification. Thus, every hospital has to pay a sum of nearly 6 000 EUR for audit, certification, benchmarking, yearly quality reports and the use of special IT-tools which were designed for the TraumaNetwork^D DGU.

Material and Methods: Coordination of traumanetwork implementation

Coordination of audit and certification process

Results: Since the beginning in the year 2006 actually 781 hospitals are participating the TraumaNetwork^D DGU. These hospitals are organized in 48 regional traumanetworks. 26% of the hospitals are

preliminary categorized as local trauma centers, 28% as regional trauma centers and 11% as over-regional traumacenters (the highest category). 33% still aren't categorized. 407 hospitals have already signed the contract with the German Trauma Society and paid the participation fee. 250 hospitals meet the criteria for audit and 153 hospitals are already audited by the firm. In October 2009 the first regional trauma network (trauma network east bavaria / TNO) was certificated with a total of 25 participating hospitals.

Conclusion: In the past 3 years the number of participating hospitals increased year by year. The nationwide acceptance and the high level of participation in the TraumaNetwork^D DGU in Germany show that the treatment of severely injured patients is one of the main topics and exercises for trauma surgeons in Germany. If the expected improvement in treatment quality and the decline in trauma mortality is only wish and fiction or reality and fact has to be proven by studies in the next years. Therefore a working group with focus on quality improvement, changes in mortality, improvement in rehabilitation results etc. was founded.

References: S Ruchholtz, H Siebert, CA Kühne, AKUT (2008) Aktueller Stand der Umsetzung des TraumaNetzwerks der DGU. Trauma Berufskrankh

Kühne CA, Mand C, Sturm J, Lackner CK, Künzel A, Siebert H, AKUT, Ruchholtz S (2009) Das TraumaNetzwerk DGU 2009. Unfallchirurg

Disclosure: No significant relationships.

T016 Missed Injuries in Dutch Level-1 Trauma Patients

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Introduction: One of the challenges in trauma care is diagnosing all injuries. Any delay in treatment can lead to increased morbidity, prolonged length of hospital stay, costs, and even mortality. Despite the use of standardized guidelines for initial evaluation such as ATLS, the incidence of missed injuries in the literature is considerable. The aim of this study was to assess the rate of missed injuries in trauma patients evaluated in two Dutch Level-1 trauma centers and to determine potential factors that contribute to injuries being missed.

Material and Methods: We assessed all radiological reports during initial admission and operation records of the 1124 patients included in the prospective randomized REACT trial. This study was part of a randomized trial conducted in two Dutch Level-1 trauma centers investigating the role of CT scanning in the trauma room. Missed injuries were defined as not diagnosed during initial radiological

evaluation in the trauma room. We assessed all missed injuries and the phase in which these injuries were diagnosed. Second, we assessed potential contributing factors by univariate analysis.

Results: Overall, 803 of the 1124 included patients were male (71.4%), mean age was 40.8 years (range 16 - 93), and 1079 patients (96%) had sustained blunt trauma. In total, 122 injuries were missed in 92 patients (8.2%). Of all missed injuries 91 were extremity injuries (74.6%), mostly with an AIS grade of 2 (80%). Sixteen injuries had an AIS grade of ≥ 3 , mostly concerning the thorax. Patients with missed injuries had significantly higher mean Injury Severity Scores (ISS) (16.3 versus 9.5, $p < 0.001$). Factors that seemed to be associated with missed injuries were severe traumatic brain injury (GCS ≤ 8), multitrauma (ISS ≥ 16), emergency interventions and ICU stabilizations. Of the missed injuries, 24 were not detected on prior adequate radiological examinations (20%). Seventy two of all missed injuries remained undetected during tertiary survey (59%). In total, 38 operations were required for 32 (26.2%) missed injuries. Thirteen of the 16 patients with AIS grade 3 or higher injuries could be treated conservatively.

Conclusion: Despite guidelines and efforts to avoid missed injuries, this problem is hard to prevent especially in the severely injured. The present results show that the rate of missed injuries was relatively low and their consequences were not severe. In multitrauma patients, patients with severe traumatic brain injury, or patients needing emergency interventions and ICU stabilization a high index of suspicion remains necessary.

References: Houshian S, Larsern MS, Holm C: Missed Injuries in a Level I Trauma Center. J Trauma 2002, 52:715-719. Brooks A, Holroyd B, Riley B: Missed Injury in Major Trauma Patients. Injury 2004, 35:407-410.

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TELEMEDICINE-MONITORING

T017 Evaluation of a Web Portal for E-Support After a Disaster: Opportunities and Lessons Learned

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Introduction: Internet and web-based technologies provide tools that have potential to change the way healthcare is delivered. In disasters, besides death toll, physical trauma, destruction and economic consequences, the psychological impact can have far reaching and long term consequences. Awareness and insight in the emotional impact of disasters can provide opportunities for surveillance and early treatment. Moreover, online support systems can contribute to

community building and support that can empower patients and contribute to resilience. In this report we describe the development and use of a web portal in the aftermath of the 2004 tsunami. We evaluate the development of a multilingual web portal that combined a platform for information, emotional support, self assessment and referral with research opportunities. The rapid development, use, advantages, difficulties and learning points are discussed.

Material and Methods: Inspired by a repatriated group of patients of the Tsunami to the Netherlands, clinicians (psychiatrists, psychologists and a surgeon), researchers and IT specialists of the University Medical Centre Utrecht, the Major Incident Hospital and the Central Military Hospital collaborated in a multidisciplinary working group. This group developed a web portal that combined the above mentioned goals with the potential for global reach.

Results: Within 3 weeks after the Tsunami, an open, online service (www.TISEI.org) was launched to foster support in the aftermath of the disaster. It combined 4 functionalities that were earlier only used separately: 1. e-forum for community building; 2. self assessment and survey; 3. E-consultation 4. an information portal. The web site had over 86,000 visitors over the first two years. The TISEI-environment was available in 15 languages and visitors came from all over the world. 95% of all visitors came from Europe and the United States. In the long run, the web portal also served as a memorial archive. Difficulties we experienced were based on funding, time pressure, patient anonymisation, international collaboration and long term maintenance.

Conclusion: Web based services in the aftermath of mass disasters can be an aid in community building and delivering low level, patient centred and easily available information and care. A multilingual website with combined modalities for emotional care and research after a natural disaster proved feasible. Growing internet penetration world wide and especially the rapid expansion and influence of online communities enables delivery of care and research performance with the internet as a platform. The unpredictable nature of disaster puts time pressure on the development of online solutions and influenced the yield of our site. This highlights the necessity of developing methods and (inter)national collaborations in advance, secure funding, and learn from earlier initiatives.

Disclosure: No significant relationships.

T018 Prospective Evaluation of a Telemedicine and Telepresence Program for Trauma and Emergency Management Using a Mesh Network

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Introduction: The United State's first operational video based Emergency Medical Services telemedicine system was officially rolled out in 2007 using a city-wide mobile WiFi MESH network, which equipped city ambulances with technology that allows them to transmit audio, video, and patient data to the receiving hospital while connected to the network.

Material and Methods: A prospective study was conducted from May 2008 to April 2009 that evaluated Clinical, Technical, Compliance, Protocol, and Human/Interdisciplinary factors and how they affect the use of the mobile telemedicine program for trauma and critical care. In total 129 actual cases and 328 test calls were reviewed.

Results: There were a total of 129 total calls performed with real patients and 328 test calls. Of the actual calls, 111 (86%) were performed while moving and 18 (14%) were done from a stationary position. Initial video quality in was rated good in 98 cases (76%) and initial audio quality was rated good in 97 (75%) cases with actual patients. 107 of the actual calls (83%) experienced some sort of temporary video drop during the entirety of the call and 93 calls (72%) experience some sort of temporary audio drop. These drops were a result of the setup of MESH WiFi and the need to jump from router to router. Users in the hospital found the program to be a very useful trauma and emergency medicine tool, but adjustments need to be made to improve the network.

Conclusion: The use of telemedicine in a pre-hospital setting may play a significant role in the management and treatment of trauma and critically ill patients as hospital medical staff can intervene in real time during transport. Patients can be evaluated in real time which allows the necessary staff and resources to be available on arrival. Initial user feedback has been encouraging with users acknowledging its usefulness as a pre-hospital tool.

References: Latifi R, Weinstein RS, Porter JM, et al. Telemedicine and Telepresence for Trauma and Emergency Care Management. *Scand J Surg.* 2007;96(4):281-9.

Disclosure: No significant relationships.

T019 The Value of eGFR in Emergency Surgery Patients

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Introduction: A variety of scoring systems are in use to predict which patients are likely to benefit from critical care but their use is often unwieldy outside the critical care unit. A quick and readily available marker to predict good or bad outcome would be very welcome. Estimated GFR has been proposed as a predictor of outcome in high risk elective surgery(1) The purpose of this study was to identify whether eGFR is a useful predictor of outcome in emergency general surgical patients.

Material and Methods: This was a retrospective observational study using the ICNARC (Intensive Care Network Audit and Research Centre) database, Hospital Information System and the NHS information system. Search parameters were set to give demographic and length of stay details as well as APACHE II on ITU admission. These were then cross referenced to obtain eGFR on admission to Hospital, admission to and discharge from ITU as well as Survival to Hospital Discharge rates. eGFR has been routinely added to our chemical pathology reports since 2005 and is calculated using the Modification of Diet in Renal Disease equation. eGFR is expressed as mL/min/1.73 m² The characteristics of survivors were compared with non-survivors.

Results: 580 patients were identified in the study period. Complete data was available for 553. The crude mortality rate was 26.4%. There were significant differences in eGFR on hospital admission, eGFR on ITU admission, eGFR on ITU discharge, change in eGFR over time and APACHE II on ITU admission. Area under the curve for eGFR on ITU admission and APACHE II was 0.67 and 0.72 respectively. An eGFR < 40 was the most useful for predicting poor outcome. At this level eGFR had a sensitivity of 86.24% and specificity of 24.66%. At eGFR < 50 relative risk of death was 1.67. Patients with an eGFR < 50 on admission to hospital who failed to show an improvement with ITU care were 3.26 times more likely to die than those with an eGFR > 50 who did show improvement.

Conclusion: These findings in emergency general surgical ITU admissions reflect those in the previous study in elective patients undergoing high risk surgery, in fact the area under the R.O.C curve was identical.⁽¹⁾ In the elective setting it is logical that a lower eGFR reflects poor renal function and low overall physiological reserve. The same is not obviously true for emergency patients who may have an “artificially” low eGFR merely as a reflection of acutely altered fluid balance. Change in eGFR from admission to hospital to ITU admission was also significantly different between survivors and non-survivors. This would suggest that eGFR reflects a response to treatment as well as renal function. This study supports the use of eGFR in the decision making process when trying to predict outcome in emergency general surgery patients.

References: (1) The relationship between renal function and outcome from heart valve surgery. Gibson P, Croal B, Cuthbertson B et. al. Am Heart J November 2008.

Disclosure: No significant relationships.

T020 Monitoring Therapeutic Activities on a Surgical Medium Care Using TISS-28

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Introduction: The Surgical Medium Care (SMC) in our hospital is a 6 bed ward with monitoring facilities, and is used critical ill patients from the trauma and other surgical wards. Over the last years there has been an increase in the number and severity of trauma patients admitted to out hospital, as well as there has been an increase in patients undergoing major elective surgery. The aim of this study was to verify if these trends are reflected in an increase in patient- and workload on our SMC. In this study we describe the patient- and workload on the SMC between 2000 and 2008 using the TISS-28. The modified Therapeutic Intervention Scoring System (TISS-28) is a validated score of therapeutic activities and an alternative approach to evaluate outcome of critically ill patients⁽¹⁻³⁾.

Material and Methods: A prospective cohort study of all consecutive patients admitted to the SMC between 01/01/2000 and 31/12/2008 was performed, using the TISS-28 database. Of all admitted patients a daily TISS-score was performed. Besides the TISS data, patients demographics, referring ward, discharge destination, length of stay, and hospital mortality were retrieved from the database.

Results: There were a total of 5455 admissions of 4667 patients in the study period. 64% of patients were male, 36% were female. The median Length of stay was 3 days (0-97).

The overall hospital mortality rate was 6.4%, with no significant differences over the years. 40% of the patients admitted to the SMC came from the ICU, 15% came from the emergency department, 1.5% came from home, 5.5% came from the recovery ward, and 38 % came from the trauma and surgical ward. These percentages did not change over time. The average TISS score during the study period was 20 and did not significantly differ during the study period. There was, as expected, no significant difference in TISS score between patients who survived and the non survivors. There was an increasing trend in the number of admissions between 2000 and 2008 from 640 to 700 a year ($p > 0.05$). There was a significantly increase in average length of stay between 2000 and 2008 from 3,20 to 3,64 days ($p < 0.05$). This resulted in a 24% increased patient load between 2000 and 2008 ($p < 0.05$) and a 41% increase in work load over the same period ($p < 0.05$).

Conclusion: There was a significantly increase in patient load and work load between 2000 and 2008 on the SMC. However the average TISS score did not differ in the studied period.

References: 1) Lefering R. Biostatistical Aspects of Outcome Evaluation Using TISS-28

Eur J Surg 1999; Suppl 584: 56–61 2) Cullen DJ, Civetta JM, Briggs BA, Ferrara L. Therapeutic Intervention Scoring System: a method for quantitative comparison of patient care. Crit Care Med 1974; 2: 57–60. 3) Reis Miranda D, de Rijk A, Schaufeli W. Simplified Therapeutic Intervention Scoring System: The TISS-28 items—Results from a multicenter study. Crit Care Med 1996; 24: 64–73.

Disclosure: No significant relationships.

T021 VoTeKK Preparation for Terrorist Attacks, Crises and Disasters: Web-Based Interdisciplinary Information and Training Platform to Prepare Security And Rescue Forces, Medical Personnel and the General Population for Large-Scale Emergencies

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Introduction: The demands placed on systems and organisations that protect the general population are constantly growing. The reasons for this include, among other things, circumstances altered by the threat of inter-national terrorism and the increasing frequency and magnitude of mass public events and natural catastrophes. Crisis situations such as these present unique, often completely unprecedented challenges to those affected and to all actors with responsibility for crisis management and the protection and rescue of people. With regard to effective interdisciplinary crisis management, both Germany's security and rescue forces and its general population suffer from widely acknowledged and scientifically proven deficits.

Material and Methods: This function begins with the identification of possible threats by terrorist attacks, crises and disasters and their impact on people and the society. In this context, all natural and man-made threats will be considered ("all hazards approach"). E-learning and virtual reality modules based on these scenarios will be offered to target groups via the Internet on an individualised basis.

Results: The aim of this project is to develop a platform to prepare security and rescue forces, doctors, caregivers and the general population for terrorist attacks, crises and disasters.

An online platform with a modular structure (employing teaching methods such as e learning, blended learning etc) will offer innovative and specialised instruction and advanced training to all users.

Conclusion: Experts agree that the modern teaching methods and computer-based simulations mentioned here (such as virtual reality methods) are excellent tools to help train people efficiently to respond to events that cannot be planned, such as terrorist attacks and other catastrophes.

The use of these innovative methods and completely novel, user-friendly, web-based instruction and information modules is designed to address – to a heretofore unprecedented degree – all security and rescue forces concerned as well as the general population in particular. Ultimately this will significantly improve security and rescue operations in the event of terrorist attacks, crises and disasters.

References: 1. Hsu EB, Jenckes MW, Catlett CL, Robinson KA, Feuerstein C, Cosgrove SE, Green GB, Bass EB. Effectiveness of hospital staff mass-casualty incident training methods: a systematic literature review. *Prehosp Disaster Med.* 2004 Jul-Sep;19(3):191-9. 2. Dausey DJ, Buehler JW, Lurie N. Designing and conducting tabletop exercises to assess public health preparedness for manmade and naturally occurring biological threats. *BMC Public Health.* 2007 May 29;7:92

Disclosure: No significant relationships.

T022 Digital Complication Registration Within the Trauma Department: Is it Accurate?

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Introduction: Since 2002 all patients are registered in an Electronic Medical Record (EMR) Trail®. Complications are registered according to the Trauma Registration of American College of Surgeons System (TRACS) and by the system of the Dutch College of Surgeons System (DCSS). Currently 6542 hospital admissions are registered with 6031 patients and 5783 complications. Complications in our hospital are registered primarily by residents on the trauma ward and are checked by staff members during the morning report. In order to evaluate the accuracy of our complication registration we performed a prospective cohort study.

Material and Methods: During a 6 month (2009) period an investigator followed prospectively the process during the morning report without the staff knowing. For all checked patients the diagnosis, ICD 10 classification, registered complications (TRACS and DCSS) and the corrections made by the staff were registered. Subsequently

the patient record was analyzed if the corrections were complete, adequate and if any complications were forgotten.

Results: A total of 597 patients with 688 complications were included in this study. Of the 688 complications, 124(18%) complications were noted by the staff as "missing" and added to the patients' record. After screening the patient records another 51 (7.4%) complications could be added. 71/597 patients of the group were also admitted to ICU with 156 complications. Of this group 37 (23.7%) were added after the morning report. According to the records another 22 (14.1%) complications could be added to the ICU group. The complications occurred in 20% of the patients of the normal ward and 14% of the ICU patients. Most forgotten complications are: wound infection, urinary tract infection, re-operation and death. During weekend days complications occurred less frequent than on week days (86% vs. 14%). Only 50% of complications were checked within one day after discharge. The longer the delay, the less adjustments to the complication record were made. Furthermore there is a negative correlation between the amount of presented patients during the report and the amount of corrections, above 15 patients the percentage of corrections declines rapidly. The quality of the complication check during the morning report also depends on who of the staff is present.

Conclusion: 22-38 % of the complications are primarily forgotten. After routine correction 5-7% remains undetected. Complication registration on the ICU is less accurate than on the normal ward. On the ICU, more patients get a complication, and if a patient gets a complication he/she is at risk for more complications. During the weekend the patient seems less at risk for complications. The time between discharge and correction check influences the amount of corrections. 15 is the maximum amount of patients that should be checked per session.

References: UMC Utrecht EMR 02-09

Disclosure: No significant relationships.

T023 Transarterial Embolization for Abdominal Trauma: A Report from the Japan Trauma Databank

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Introduction: Several articles from trauma centers in Japan reported that transarterial embolization (TAE) is an alternative to open surgery for the hemostasis of intra-abdominal injuries such as liver, spleen or retroperitoneal injuries[1,2]. Despite relatively common use of the trauma TAE for abdominal injuries in Japan, the reports regarding the trauma TAE were based on single-center experiences and the definite indication of the trauma TAE is unestablished. To assess a benefit of trauma TAE from a multicenter cohort, we analyzed current status of the trauma TAE for abdominal injuries in Japan, based on Japan Trauma Databank (JTDB), a multicenter, nationwide and prospectively recruited trauma registry.

Material and Methods: Of 20257 records from JTDB, we extracted isolated severe abdominal trauma victims who treated with open surgery and/or TAE, whose Abbreviated Injury Scale (AIS) on abdomen are 3 to 5, and no recorded AIS of 3 to 5 in any other region. We excluded cases of cardiopulmonary arrest on arrival at the emergency department. With demographic data, a univariate analysis and multivariate logistic regression analysis with adjustment based on trauma injury severity score (TRISS) assessed a risk of mortality of TAE against laparotomy.

Results: A total of 256 cases were included; 49 cases underwent TAE, 209 cases underwent laparotomy, and 2 cases underwent both TAE and laparotomy. Average ages of patients underwent TAE was 37 years old, and 46 years old for patients who underwent laparotomy. Median ISS and RTS for each group were 10 vs. 10, and 7.8408 vs. 7.8408, respectively. Predicted mortality rate estimated from TRISS model for each group were 98% and 93%, respectively. In-hospital mortality is 4% in patients with TAE, 12% in those with laparotomy and 50% in those with TAE and laparotomy. The univariate odds ratio (OR) for inhospital death in TAE group was 0.16 (95% confidence interval (95%CI): 0.02-1.20, p-value < 0.1). However, after adjustment for baseline trauma severity based on TRISS, the benefit of TAE did not reach any statistical significance in multivariate analysis (OR: 0.0, 95%CI: 0-inf, NS).

Conclusion: The trauma TAE demonstrated non-significant, but numerically lower mortality compared to laparotomy in patients with severe and isolated abdominal trauma. Authors concluded that the study failed to demonstrate the benefit of the trauma TAE in this multicenter cohort. To establish the definite indication for the trauma TAE, larger sized multicenter study is required.

References: 1) Hagiwara A et al. AJR Am J Roentgenol 1996;167:159-166. 2) Sugimoto K et al. Injury 1994;25:283-287

Disclosure: No significant relationships.

T024 Total Body CT Scanning in Severe Trauma Patients

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Introduction: Total body CT scanning (TBCT) is becoming more popular as the primary evaluation tool in severely injured patients. Discussion is going on about the effects on clinical outcomes and side effects such as unnecessary radiation exposure. In preparation of a randomized multicenter study severely injured patients are evaluated with TBCT in the AMC. Aim of this study was to assess several important time intervals of the TBCT work-up.

Material and Methods: From January 2009 all consecutive severely injured patients presented in the trauma resuscitation room during office hours were checked for eligibility. Inclusion criteria were based on life-threatening vital parameters or clinical suspicion on severe

injuries. Patients were excluded if aged less than 18 years, known pregnancy or if the trauma team leader judged the patient too unstable to undergo a CT scan. TBCT consisted of a scan of the brain and C-spine without contrast and CT of the chest and abdomen with intravenous contrast. Preceding conventional X-rays and ultrasonography were completely omitted.

Results: Of the 31 included patients 74% was male, mean age was 50 years (range 20-94), 97% had sustained blunt trauma and mean ISS was 24 (range 0-75). 67% were multitrauma patients (ISS ≥ 16). CT scanning was initiated after 11.9 minutes and concluded after 18.8 minutes. Seven patients required life-saving interventions before CT scanning began. Most of the time spent between the start and end of scanning was for repositioning of the patient's arms. Within a mean of 29.7 minutes all diagnoses were available to plan definitive treatment (51% stabilization/observation in the ICU; 39% to the OR; 10% observation ward). Within a mean of 43.7 minutes all patients had left the trauma room. Overall mortality was 19.4 % (n = 6). Five patients died after severe traumatic brain injury. Two patients did not have severe injuries despite having potential life-threatening vital parameters. Three patients were excluded because of their hemodynamic instability or severity of injuries at the time of inclusion. One patient had abdominal evisceration after penetrating trauma and two were traumatic reanimation patients.

Conclusion: Total body CT scanning in severely injured patients appears fast, effective and safe while using strict in-and exclusion criteria. To optimize the TBCT evaluation strategy for severely injured patients and to prevent overtriage, validation of in- and exclusion criteria is required. Therefore, an RCT is currently in preparation.

Disclosure: No significant relationships.

LAPARASCOPY

T025 Is Laparoscopy Still Needed in Blunt Abdominal Trauma?

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Introduction: Laparoscopy, as a minimally invasive diagnostic and therapeutic tool in blunt abdominal trauma (BAT), is not commonly used and has been shown to be controversial. The aim of this study is to assess the role of laparoscopy in the diagnosis and therapy of BAT.

Material and Methods: A systematic review and a comprehensive literature search was performed at the U.S. National Library of Medicine site in Medline and PubMed from 2000 to 2007. This article attempts to outline the efficacy, the indications, contraindications, surgical technique and therapeutic possibilities of laparoscopy in BAT. Pediatric surgery articles and those addressing penetrating abdominal wounds, nontraumatic abdominal emergencies and iatrogenic injuries were excluded from this review.

Results: Sixty-six articles were reviewed, which included 22 case studies, 27 case reports, 17 reviews and 2 guidelines. The reviewed articles comprised 343 patients with BAT and laparoscopic approach. Therapeutic laparoscopy was possible in 168 cases (48, 98%), 51 cases were converted (14,87%), overlooked injuries were absent, 6 patients had complications (1,75%), no mortality laparoscopy-related. The main indications for laparoscopy in BAT include the confirmation of

suspected diaphragmatic defects, suspected hollow viscus and mesenteric injuries, in patients with inconclusive clinical exams and abdominal imaging. Diagnostic laparoscopy (DL) is also indicated in patients with suspected intra-abdominal injuries when advanced emergency imaging investigations are unavailable. Laparoscopy allows the surgeon to perform hemostasis, resections, suturing, autotransfusion, etc.

Conclusion: Although is not widely used, laparoscopy could still be useful in selected patients with BAT who have equivocal findings on clinical exam and imaging investigations in order to clarify the lesion diagnosis, thus avoiding unnecessary laparotomies. Multicenter prospective studies are needed to better assess the role of laparoscopy in blunt abdominal trauma.

Disclosure: No significant relationships.

T026 The Laparoscopic Approach in Abdominal Emergencies: Has the Attitude Changed? A Single-center Review of a Last 5-Year Experience

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Introduction: Laparoscopy has been practiced more and more in the management of abdominal emergencies. Aim of the present work is to illustrate retrospectively the results of a case-control last 5-year-experience of laparoscopic vs. open surgery for abdominal emergencies carried out at our institution, especially trying to point out how is our attitude changed in this last period compared with the beginning of our laparoscopic emergency experience (1991 to 2002).

Material and Methods: From January 2002 and January 2007 a total of 670 patients underwent emergent and/or urgent laparoscopy (small bowel obstruction 17; gastro-duodenal ulcer disease 16; biliary disease 118; pelvic disease and NSAP 512 cases; colonic perforations 7) according to the presence of a surgical team trained in laparoscopy.

Results: The conversion rate was 0.15%. Major complications ranged as high as 1.9% with no postoperative mortality. A definitive diagnosis was accomplished in 98.3% of the cases, and all of such patients were treated successfully by laparoscopy.

Conclusion: In a proper setting, laparoscopic emergency is feasible, effective, safe and beneficial for patients to be a part of a common surgical practice, as long as adequate training is obtained and proper preparation observed when more advanced procedures are attempted in critically patients. The diagnostic and therapeutic versatility afforded by the laparoscopic approach avoids extensive preoperative studies, averts delay in operative intervention and minimize morbidity and shorten the postoperative hospitalization. We do think that laparoscopy should be incorporated into general surgeon's armamentarium for the management of patients with acute abdomen as just as another tool to be used selectively when indicated. Laparoscopy, however, must not be used as an alternative to good clinical judgment. About our algorithm in patients with acute abdomen: if there aren't any contraindications to laparoscopy, obtained an informed consensus, in presence of a well trained surgical team in minimally-invasive surgery, excluded any major gynaecological diseases (about which we and our gynaecological colleagues haven't a skilled experience with a laparoscopic approach), we always approach laparoscopically.

References: Agresta F, De Simone P, Bedin N (2004) The laparoscopic approach in abdominal emergencies: a single-center 10-year experience. *JSLs* 8: 25-30. Golash V, Willson PD. (2005) Early laparoscopy as a routine procedure in the management of acute abdominal pain. A review of 1320 patients. *Surg Endosc* 19:882-885. Lam CM, Yuen AW, Chik B, Wai AC, Fan ST (2005) Laparoscopic surgery for common surgical emergencies. A population-based study. *Surg Endosc* 19: 774-779. Salem TA, Molly RG, O'Dwyer PJ (2005) Prospective study on the role of the CT scan in patients with an acute abdomen. *Colorectal Dis* 7(5): 460-6; Sauerlenad S, Agresta F, Bergamaschi R, Borzellino G, Budzynsky A, Champault G, Fingerhut A, Isla A, Johansson M, Lundorff P, Navez B, Saad S, Neugebauer EA. Laparoscopic for abdominal emergencies: evidence based guidelines of the European Association for Endoscopic Surgery *Surg Endosc* 2006, 20(1): 14-29; Warren O., Kinross J, Paraskeva P, Darzi A. (2006) Emergency laparoscopy – current best practice. *WJES* 1:24 doi 10.1186/1749-7922-1-24

Disclosure: No significant relationships.

T027 Laparoscopically-assisted Mini-thoracotomy: A Novel Surgical Technique for Repair of Diaphragmatic Injuries

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Introduction: Stable patients with thoracoabdominal penetrating or blunt injuries resulting in diaphragmatic injuries represent a difficult and challenging management dilemma. Although laparoscopy and thoracoscopy have now emerged as the most reliable and efficient diagnostic and treatment modality of these injuries, a conversion to laparotomy for mere evidence of peritoneal penetration and or diaphragmatic injuries is common for most trauma surgeons.

Material and Methods: We hypothesized that laparoscopically-assisted mini-thoracotomy for repair of diaphragmatic injuries will be as effective as open laparotomy or thoracotomy and will prevent the morbidity associated with open technique and should be used in hemodynamically stable trauma patients. We designed a minimally invasive technique that combines laparoscopic exploration of the intraperitoneal cavity and existing injury site as an entrance to the injured site or organ. Open Hassan technique, using vertical midline incision is used to create the pneumoperitoneum. Additional two to three 5 or 10 mm ports are placed to enable thorough examination of the peritoneum, running the small bowel and examining other abdominal viscera. Diaphragmatic lacerations are repaired by extending (3-4 cm) the existing thoracic stab or gunshot wound. The diaphragm is grasped with two graspers and brought to the operative field. Continuous or interrupted suture are used for repair.

We applied this technique to 8 hemodynamically stable trauma patients (LA group) treated over a 4 year period at the university Level I trauma center and compared to 10 trauma patients requiring laparotomy (OG) for isolated diaphragmatic injury repair. All laparoscopically assisted procedures were performed by the senior author (RL). Length of stay, morbidities and complications were studied in both groups. Both groups were matched for ISS, age, and gender and mechanism of injuries.

Results: There were 8 patients (five with stab, two with gunshot wound and one with blunt trauma and chronic diaphragmatic injury) in the LA group. All 8 patients underwent laparoscopic-assisted mini-thoracotomy. The average length of stay for LA group was 4.4 days (range 1-8 days). There were no tension pneumothoraxes, no missed injuries in lap group or other complications.

Conclusion: Laparoscopically assisted repair of diaphragmatic injuries is viable and superior to open technique and should be incorporated into the armamentarium of modern trauma surgeons for the management of stable penetrating injuries to the thoracoabdominal and flank area in patients without an obvious indication for laparotomy.

Disclosure: No significant relationships.

T028 Selection Criteria Analysis for Laparoscopic Treatment of Small Bowel Obstruction on a 100 Patients Series

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Introduction: Laparoscopic treatment of small bowel obstruction (SBO) is feasible, but there is not agreement on selection criteria. No RCT were published till now. Some available guidelines does not consider laparoscopy (1). EAES guidelines suggest bowel loop diameter > 40 mm, more than 2 previous operations and complete and distal obstruction as contraindications to laparoscopy (2). We retrospectively reviewed our series to validate this criteria.

Material and Methods: From November 2003 to September 2009, 100 patients (pts) underwent surgery for SBO. Twenty-seven (27%) were submitted to open surgery, 73 (73%) to laparoscopic exploration. EAES criteria were analyzed on the overall series and for three different subsequent periods (41 pts, 67 pts, 100 pts).

Results: Among open surgery group, the causes of obstruction found at operation were 2 single adhesions, 7 extended adhesions, 2 volvulus, 1 incarcerated hernia, 7 carcinomatosis, 1 Crohn disease, 5 volvulus, 2 bezoar, 2 intestinal ischemia. Among laparoscopic group, 16 single adhesions, 21 extended adhesions, 21 volvulus, 5 internal hernias, 2 small bowel endometriosis, 3 carcinomatosis, 1 intussusception, 2 Crohn disease, 2 bezoars. The overall conversion rate after laparoscopic approach was 46.5% (64.2% for the first 41 pts, 54.2% for the 67 pts series). Causes of conversion were impossibility to perform exploration for loops distension in 6 cases, inability to perform adhesiolysis in 5, need for resection or internal by-pass in 15, unclear origin in 2, bezoar removal in 2. Unexpected findings at laparoscopy were reported in 2. A tailored minilaparotomy (< 10 cm long) guided by laparoscopic findings was performed in 10 pts (30.3 % of laparoscopic group). Pts with loop diameter > 40 mm had a conversion rate of 54% in comparison to those with diameter < 40 mm (5.5%), which was statistically significant ($p = 0.013$, chi square-test). No statistically significant differences were found regarding conversion rate in pts with/without > 2 previous abdominal operations and complete/incomplete obstruction.

Conclusion: Loop diameter > 40 mm is the only significant negative predictive factor for successful laparoscopic treatment of small bowel obstruction. According to EAES selection criteria, 13 (48%) pts in open surgery group could have been submitted to laparoscopy as first approach, half of them with a successful outcome. A trained team can progressively decrease the rate of unsuccessful laparoscopy. Tailored laparotomy should be considered as an advantage of the laparoscopic approach

References: References 1- Diaz JJ, Bokhari F, Mowery NT, et al. Guidelines for the management of small bowe obstruction. J Trauma 2008; 64:1651-64. 2- Sauerland S, Agresta F, Bergamaschi R, et al Laparoscopy for abdominal emergencies. Surg Endosc 2006; 20:14-29

Disclosure: No significant relationships.

T029 Laparoscopy in Acute Small Bowel Obstruction due to Adhesions and Internal Hernia: Advantages and Limits

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Introduction: Acute small bowel obstruction is mostly due to adhesions (83%), while internal hernia can cause acute small bowel obstruction in 2% of cases. This clinical condition has been considered for many years a relative contraindication for laparoscopic surgical treatment. With the introduction of CT-scan in the diagnosis of this clinical situation and the experience in laparoscopic techniques, more surgeons are now attempting laparoscopic management for this indication. The advantages of laparoscopy in abdominal surgery are now well defined, such as a shorter intestinal function recovery, a shorter hospital stay and less post-operative pain complained by the patients. In our presentation we want to analyse the importance of laparoscopy in the diagnosis and the treatment of acute small bowel obstruction, in order to underline advantages and limits of this technique.

Material and Methods: In San Raffaele Hospital Milan (Italy) a total of 136 patients underwent a surgical intervention for small bowel obstruction from January 2007 to December 2008. 98% of the obstructions was due to adhesions, 2% to internal hernias. All the patients underwent preoperative abdominal X-Ray and CT-scan.

Results: Of the total of patients, 30 have been operated on with a laparoscopic approach, with a conversion rate of 33.3%. Postoperative morbidity was 0% in the laparoscopic group and 1.22% in the traditional surgical approach, with a shorter hospital staying in the first group.

Conclusion: The analysis of our data suggests us that the selection of patients that can benefit from a laparoscopic approach to acute small bowel obstruction has to be made accurately, better with the use of CT-scan, in order to limit the percentage of useless laparoscopy and to diminish the conversion rate and to give the patient the better curative option.

References: Ghosheh B et al. Laparoscopic approach to acute small bowel obstruction: review of 1061 cases. Surg Endosc 2007 Nov;21(11):1945-9. Dindo D et al. Laparoscopy for small bowel

obstruction: the reason for conversion matters. *Surg Endosc* 2009 Sep 3. Lee IK et al. Selective laparoscopic management of adhesive small bowel obstruction using CT guidance. *Am Surg*. 2009 Mar;75(3):227-31.

Disclosure: No significant relationships.

T030 Palliative or Neoadjuvant Laparoscopic Techniques for Large Bowel Obstruction

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Introduction: Intestinal obstruction has remained one of the most common surgical emergencies. The aim of our study is to evaluate the feasibility, safety and palliative role of laparoscopic bowel surgery in the management of large bowel obstruction.

Material and Methods: In a period of 2 years, 15 patients were subjected to loop sigmoidostomy. In 12 patients the diagnosis was bowel obstruction due to rectal cancer. In 3 patients the obstruction was attributed to ovarian cancer. From those 12 patients with rectal cancer, 10 patients had contaminant liver and lung metastases and 2 had an unresectable liver lesion. In that period 2 lap-assisted ileo-transverse anastomosis were performed due to obstruction from cecum carcinoma together with multiple liver and lung metastases.

Results: The mean age was 52 years. The mean operative time in patients with loop sigmoidostomy was 35 min. The median time of food intake was 1 day. IV analgesics required only the first day after surgery. The median length of stay was 3 days. The mean time for chemotherapy treatment initiation was 15 days postoperatively. The mean operative time in patients with lap-assisted ileo-transverse anastomosis was 50 min. The food intake started the 4th postoperative day. The iv analgesics need limited only to 2 days. The patients discharged the 7th postoperative day. There were no major complications in follow-up period (mean 11 months).

Conclusion: Large intestinal bowel obstruction treated by laparoscopic techniques for palliation seems a feasible and safe treatment option. Faster recovery and need for less postoperative analgesia in laparoscopic surgery is of great benefit for those patients.

Disclosure: No significant relationships.

T031 Surgeon-performed Ultrasound for Acute Appendicitis. Can we Decrease the Number of Negative Appendectomies and Avoid Related Economic Loss?

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Introduction: Acute appendicitis (AA) is the most common acute abdominal disease requiring an acute surgical procedure; the ideal clinical diagnostic pathway is however still unclear. In the majority of

cases indication to surgery infact is still based on the combination of laboratory test and clinical findings. As a result, a high number of negative appendectomies (NE) is performed ranging from 15% to 30% of the removed appendices (1), with high economic loss. To improve diagnostic accuracy, ultrasound (US) or computed tomography (CT) have been increasingly used (2, 3), but if sensitivity of CT is higher and less observer-dependent than US, it is relatively expensive and exposes the patients to high radiation dose. In acute care In this study we tried to analyze the efficacy of surgeon-performed point of care ultra-sound (POCUS).

Material and Methods: A retrospective analysis of 241 appendectomies was performed from 2004 to 2009. A POCUS study was performed whenever a surgeon trained in US was available and a total of 202 US exams was performed; in 177 pts appendix could be localized and US diagnosis was considered clear, while in 25 pts US was considered unclear and CT was performed in 18 cases. The other 7 patients underwent surgery with no further investigation. 39 pts underwent surgery after simple clinical investigations (15 pts) or CT (24). Laparoscopic appendectomy was the treatment of choice and open appendectomy was sometimes considered when appendix could be easily identified or well localized by US.

Results: The correlation to histological signs of inflammation for acute appendicitis in different groups was the following: POCUS clear diagnosis (177/177): 100% POCUS unclear diagnosis undergoing further investigation with CT Scan (18/18): 100% POCUS unclear diagnosis undergoing directly to surgery (4/7): 57,1% CT diagnosis (24/24): 100% Clinical investigation alone (11/15): 73,3% One appendix carcinoid with histological signs of acute appendicitis was detected in each POCUS clear diagnosis and CT diagnosis series. Single surgeon-performed POCUS in the evaluation of acute appendicitis led to a correct diagnosis in 87,6% (177/202). Surgeons trained in US ordered a CT scan in 8,9% of cases and ratio of negative appendectomy was 1,5%. Surgeons not trained in US ordered a CT scan in 61,5% and their ratio of negative appendectomy was 28,2% (including pts that underwent surgery on clinical investigation basis only).

Conclusion: Surgeon-performed POCUS has a high sensitivity in the assessment of acute appendicitis and it is a powerful tool that minimize the use of CT scan and ratio of negative appendectomy with reduction of hospital and social costs; furthermore an advantage for the patients in terms of radiation exposure can be achieved. Moreover, to reduce additional costs, laparoscopic approach should be indicated only when the appendix cannot be perfectly visualized and localized.

References: 1. Bijnen CL, Van Den Broek WT, Bijnen AB, De Ruiter P, Gouma DJ. Implications of removing a normal appendix. *Dig Surg*. 2003;20(2):115-21. 2. Anderson SW, Soto JA, Lucey BC, Ozonoff A, Jordan JD, Ratevosian J, Ulrich AS, Rathlev NK, Mitchell PM, Rebholz C, Feldman JA, Rhea JT. Abdominal 64-MDCT for suspected appendicitis: the use of oral and IV contrast material versus IV contrast material only. *AJR Am J Roentgenol*. 2009 Nov;193(5):1282-8. 3. Binnebaugh M, Otto J, Stumpf M, Mahnken AH, Gassler N, Schumpelick V, Truong S. Acute appendicitis. Modern diagnostics-surgical ultrasound. *Chirurg*. 2009 Jul;80(7):579-87.

Disclosure: No significant relationships.

POLYTRAUMA

T032 Preclinical and Clinical Volume Management – Changes in the Past 10 Years in Germany

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Introduction: Severe bleeding is, besides head injury, the most important predictive factor in severe trauma. Therapy of hemorrhagic shock starts already at the scene of accident. However, the best strategy regarding preclinical volume therapy is controversially discussed. The TraumaRegister of the German Society for Trauma Surgery (TR-DGU) observes the routine management of severely injured patients since many years. This registry will be used to describe the behaviour of preclinical volume administration as well as the consequences in early hospital care and its changes during the last ten years.

Material and Methods: The TR-DGU is a voluntary anonymous documentation of severely injured patients for the purpose of quality management. Data collection started in 1993. About 100 parameters are collected per patient. For the present investigation only adult patients (age ≥ 16) admitted directly from the scene to one of the participating hospitals during the past ten years (1999-2008) were considered. A minimum injury severity of ISS ≥ 9 and available data for volume administration and blood transfusion were required. Means and prevalence rates were analyzed on a yearly basis.

Results: A total of 25,935 patients injured between 1999 and 2008 were analyzed. Mean age was 44.2 years, and 73% of patients were males. In 95% of cases there was a blunt trauma mechanism, and 30% of cases were unconscious at the scene (GCS ≤ 8). Mean ISS was 26.3 points and hospital mortality rate was 15.2%. 88.2% of patients received some kind of fluids during the preclinical phase. There was strong decrease in the amount of fluid administered per case. In 1999, each patient received on average more than 1850 ml, while in 2008, the average amount per case has decreased to 1133 ml. The ratio of crystalloids to colloids changed in that period from about 2:1 to 3:1. This development was accompanied with less need for blood transfusion in the early hospital phase. Overall, 27.1% of patients received at least one unit of pRBC, and 7.3% required a mass transfusion (10 units or more). During the observation period these figures also dramatically decreased from 40.8% / 13.1% in 1999 to 22.5% / 5.5% in 2008.

Conclusion: Fluid administration during the preclinical phase has changed dramatically in the past ten years. In parallel, requirement of blood transfusion in hospital also decreased substantially. Although causal relationships are difficult to establish in observational trials, the presented development seems to be closely related. It could well be one of the reasons for the observed decrease in hospital mortality in recent years.

Disclosure: No significant relationships.

T033 Patterns of Interfacility Transfers in a Non-Trauma System Setting: Does it Differ?

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Introduction: This study aims to assess interfacility transfers that eventuate in the absence of a formal trauma system setting and to estimate the potential benefits from the implementation of a more organized structure.

Material and Methods: The "Report of the Epidemiology and Management of Trauma in Greece" is a one year project of trauma patient reporting throughout the country. It provided data concerning the patterns of interfacility transfers. In this study, the transferred patient group was compared to the non transferred patient group. Information reviewed included patient and injury characteristics, need for an operation, Intensive Care Unit (ICU) admittance and mortality. Analysis employed descriptive statistics and Chi-square test. Interfacility transfers were then assessed according to each health care facility's availability of five requirements; Computed Tomography scanner, ICU, neurosurgeon, orthopedic and vascular surgeon.

Results: Data on 8,524 patients were analyzed; 86.3% were treated at the same facility, whereas 13.7% were transferred. Transferred patients tended to be younger, male, and more severely injured than non transferred patients. Moreover, they were admitted to ICU more often, had a higher mortality rate but were less operated on compared to non transferred patients. The 34.3% of transfers was from facilities with none of the five requirements, whereas the 12.4% was from those with at least one requirement. Facilities with up to three requirements transferred 43.2% of their transfer volume to units of equal resources.

Conclusion: Trauma management in Greece results in a high number of transfers. Patients are frequently transferred between facilities with officially similar capabilities. Better coordination could lead to improved outcomes and less cost.

References: Esposito TJ, Crandall M, Reed RL, Gamelli RL, Luchette FA. Socioeconomic factors, medicolegal issues, and trauma patient transfer trends: Is there a connection? *J Trauma*. 2006 Dec; 61(6):1380-6. Ciesla DJ, Sava JA, Street JH 3rd, Jordan MH. Secondary overtriage: a consequence of an immature trauma system. *J Am Coll Surg*. 2008 Jan; 206(1):131-7. Koval KJ, Tingey CW, Spratt KF. Are patients being transferred to level-I trauma centers for reasons other than medical necessity? *J Bone Joint Surg Am*. 2006 Oct; 88 (10):2124-32. Tinkoff GH, O'Connor RE, Alexander EL 3rd, Jones MS. The Delaware trauma system: impact of Level III trauma centers. *J Trauma*. 2007 Jul; 63(1):121-6; Helling TS. Trauma care at rural level III trauma centers in a state trauma system. *J Trauma*. 2007 Feb; 62(2):498-503. Barringer ML, Thomason MH, Kilgo P, Spallone L. Improving outcomes in a regional trauma system: impact of a level III trauma center. *Am J Surg*. 2006 Nov; 192(5):685-9.

Sampalis JS, Denis R, Lavoie A, Fr¹chette P, Boukas S, Nikolis A, Benoit D, Fleischer D, Brown R, Churchill-Smith M, Mulder D. Trauma care regionalization: a process-outcome evaluation. *J Trauma*. 1999 Apr; 46(4):565-79. Newgard CD, McConnell KJ, Hedges JR, Mullins RJ. The benefit of higher level of care transfer of injured patients from nontertiary hospital emergency departments. *J Trauma*. 2007 Nov; 63(5):965-71. Wong K, Levy RD. Interhospital transfers of patients with surgical emergencies: areas for improvement. *Aust J Rural Health*. 2005 Oct; 13(5):290-4. Cooney JA. Interhospital transfers. *Br J Anaesth*. 2005 Jul; 95(1):112-3. Golestanian E, Scruggs JE, Gangnon RE, Mak RP, Wood KE. Effect of interhospital transfer on resource utilization and outcomes at a tertiary care referral center. *Crit Care Med*. 2007 Jun; 35(6):1470-6. Weinberg JA, McKinley K, Petersen SR, Demarest GB, Timberlake GA, Gardner RS. Trauma laparotomy in a rural setting before transfer to a regional center: does it save lives? *J Trauma*. 2003 May; 54(5):823-6; discussion 826-8. O'Connor RE. Specialty coverage at non-tertiary care centers. *Prehosp Emerg Care*. 2006 Jul-Sep; 10(3):343-6. Sihler KC, Hansen AR, Torner JC, Kealey GP, Morgan LJ, Zwerling C. Characteristics of twice-transferred, rural trauma patients. *Prehosp Emerg Care*. 2002 Jul-Sep; 6(3):330-5. Spain DA, Bellino M, Kopelman A, Chang J, Park J, Gregg DL, Brundage SI. Requests for 692 transfers to an academic level I trauma center: implications of the emergency medical treatment and active labor act. *J Trauma* 2007 Jan; 62(1):63-67. Newgard CD, McConnell KJ, Hedges JR. Variability of trauma transfer practices among non-tertiary care hospital emergency departments. *Acad Emerg Med*. 2006 Jul; 13(7):746-54. Ahmed JM, Tallon JM, Petrie DA. Trauma management outcomes associated with nonsurgeon versus surgeon trauma team leaders. *Ann Emerg Med*. 2007 Jul; 50(1):7-12. Weninger P, Mauritz W, Fridrich P, Spitaler R, Figl M, Kern B, Hertz H. Emergency room management of patients with blunt major trauma: evaluation of the multislice computed tomography protocol exemplified by an urban trauma center. *J Trauma*. 2007;62(3):584-591. Bulger EM, Nathens AB, Rivara FP, MacKenzie E, Sabath DR, Jurkovich GJ. National variability in out-of-hospital treatment after traumatic injury. *Ann Emerg Med*. 2007 Mar; 49(3):293-301.

Disclosure: No significant relationships.

T034 Randomized Trial Comparing the Value of a CT Scanner in the Trauma Room with a CT Scanner in the Radiology Department; The REACT Trial

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Introduction: CT scanning is widely used in trauma patients. However, CT scanning poses several problems because in many hospitals

the scanner is located at the Radiology Department, requiring potentially dangerous and time-consuming transports and transfers of the patient. We hypothesized that a CT scanner in the trauma room itself improves patient outcomes.

Material and Methods: In a randomized controlled trial from November 2005 till November 2007 all trauma patients aged ≥ 16 years that required presentation in one of the two Level-1 trauma centers (AMC or VUmc) were eligible. In the AMC the CT scanner was located in the trauma room (intervention group) and in the VUmc the scanner was located in the Radiology Department (control group). Randomization was performed prehospitally at the time of dispatch from the scene. Primary outcome measure was the number of non-institutionalized days within the first year following trauma. Secondary outcomes were mortality, length of initial admission and transfusion requirements. Preplanned subgroup analyses consisted of multitrauma patients and severe traumatic brain injury (TBI) patients.

Results: In total, 1124 patients were included for analysis of which 264 were multitrauma patients and 121 had severe traumatic brain injury (TBI). Demographic data were comparable between both groups except that there were more multitrauma patients evaluated in the AMC. The median number of days spent outside the hospital during the first year was 360 days in the intervention group and 362 days in the control group ($p = 0.17$). Overall 30-day mortality was comparable for both the control and intervention group (5.0% vs. 5.2%; $p = 0.89$). In the intervention group multitrauma patients spent 336 days alive and outside the hospital in the first year after trauma and their 30-day mortality was 16.1% compared with 320 days and 20.7% for the control group. In the severe TBI patients these numbers were respectively 229 days and 35.9% for the intervention group and 156 days and 40.4% for the control group. For both the multitrauma patients and severe TBI patients there was also a trend in better overall survival and less transfusion requirements for the intervention group. Median hospital transports and transfers were reduced by half.

Conclusion: In this trial a CT scanner located in the trauma room provided no clinical benefit for the majority of trauma patients. However, this setting has logistical advantages and seems primarily valuable for severely injured or TBI patients. Further research should focus on these subgroups.

Disclosure: 5 This trial was sponsored by an unrestricted grant from ZonMw, the Netherlands Organization for Health Research and Development. (Grant number 3920.0005).

T035 Preceding Computed Tomography Prior to Emergency Surgery Correlate to Higher Mortality as was Expected

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Introduction: Computed tomography (CT) is an accepted imaging tool for analyzing anatomical severity of trauma patients. However, various guidelines warned the use of CT prior to emergency hemostasis in patients with hemodynamic instability. Our study purpose is to test the working hypothesis that CT is the tunnel of

death is fault, using the Japan trauma databank (JTDB), a multi-center and nationwide registry of hospitalized trauma patients in Japan.

Material and Methods: Of 20257 records registered in JTDB, we selected the trauma patients who underwent CT and emergency hemostasis including celiotomy, thoracotomy or pelvis transluminal arterial embolization with the exact times of undergoing. With an adjustment for baseline trauma severity based on trauma injury severity score (TRISS), a multivariate logistic regression analysis assessed the odds ratios (OR) for the inhospital survival of CT preceding compared with the emergency hemostasis preceding for all the selected patients and the patients stratified by shock index, time to the hemostasis, TRISS probability of survival.

Results: A total of 297 patients matched the criteria. Patients with CT preceding showed significant delaying to the emergency hemostasis compared with patients with the emergency hemostasis preceding. After an adjustment for the trauma severity, the patients with shock index higher than 1.0, and time to hemostasis within 60 minutes correlate to significantly higher relative risk of CT preceding (OR: 4.8, 95% confident interval (95%CI): 1.0-22.9, P 0.05). Stratification analysis showed no significant difference of relative risk of CT preceding due to shock index, time to hemostasis, and TRISS.

Conclusion: In patients who require emergency hemostasis, a delay for preceding CT may halved a chance of survival, especially in trauma patients with higher shock index.

Disclosure: No significant relationships.

T036 Injury Patterns and Performed Operations seen in Polytraumatized Children. Consequences for the Emergency Room Management?

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Introduction: The effective initial treatment in the emergency room of polytraumatized children requires a sound knowledge of common injury patterns, incidence, mortality, and consequences. The needed initial radiological imaging remains controversial and should be adapted to the expected injury pattern.

Material and Methods: In this retrospective study, the injury patterns of 56 polytraumatized paediatric patients (age ≤ 16 years) in the period from December 2001 to May 2009 were evaluated. All children were initially diagnosed with a whole body CT scan. The cause of accident, the localization including the detailed diagnose, the lethality and the severity of the injuries were analyzed. The AIS (Abbreviated Injury Scale) and ISS (Injury Severity Score) were used to classify the severity of injuries in different body regions. Moreover the number and the kind of operation as a consequence of the initial made diagnoses were investigated.

Results: The mean score of the ISS was 30 ± 13 in 38 boys and 18 girls with a mean age of ten years. The lethality was 11% and only 4% in the first 24 hours.

The most severe and most frequent injury was craniocerebral trauma in 89% with an AIS ≥ 3 in 80%. Surgical intervention of the head

was done in 41%. Thorax injuries were found in 63% with 57% with an AIS ≥ 3 and in 11% a thoracic drainage was needed.

Abdominal trauma was found in 34% (surgery 4%) with an AIS ≥ 3 in 32%. Fractures of the spine occurred in 14% (surgery 5%) with an AIS ≥ 3 in 4% and pelvic injuries were diagnosed in 16% (surgery 4%) with an AIS ≥ 3 in 14%. Injuries of the upper extremity were found in 23% (surgery 11%) with an AIS ≥ 3 in 5% and of the lower extremity in 32% (surgery 16%) with an AIS ≥ 3 in 13%.

Conclusion: Especially because of the detected high percentage of head and thorax injuries in polytraumatized children and the needed head surgery the authors recommend a whole body CT scan in children who are potentially polytraumatized. Not only in adults but especially in children the authors suggest the initial use the quickest imaging with a high sensitivity- the whole body CT scan.

Disclosure: No significant relationships.

T037 Characteristics of Polytrauma Patients with Posttraumatic Stress Disorder in a Level 1 Trauma Centre

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Introduction: Patients who suffer physical injuries following a traumatic event are at risk for developing posttraumatic distress. Care workers in hospitals treating polytrauma patients are in an optimal position to screen and identify patients developing posttraumatic stress disorder (PTSD). To start early intervention procedures and possibly lower the prevalence, a screening instrument to identify patients at a higher risk is needed. Aims of this study were to determine if the severity of injury is related to the prevalence of PTSD and to review the personality traits of patients with PTSD. With these results a screening instrument might be developed.

Material and Methods: In 2006 and 2007 252 polytrauma patients with an Injury Severity Score > 16 were treated in our centre. Of the 174 survivors (69%) 53 adult patients were traced and sent questionnaires in November 2008. They were screened for PTSD and personality traits, coping styles, negative cognitions, level of social support and posttraumatic concerns were assessed.

Results: PTSD was demonstrated in 22.6% of the patients. However no relation was found between the severity of injuries and the prevalence of PTSD. Statistical analysis showed an increased level of neuroticism and a low level of altruism to be significant predictors of PTSD in polytrauma patients. Also expression of emotions, passive and avoiding coping styles, negative cognitions about the world and themselves and a high level of self-reproach were significant predictors of PTSD.

Conclusion: This study provides useful recommendations for developing an early mental health screening instrument to identify polytrauma patients at a high risk for developing PTSD. The high prevalence of 22.6% underlines this necessity in acute care settings.

Disclosure: No significant relationships.

HAND

T038 Minimised Soft Tissue Injury and Improved Bone Healing in Osteosynthesis of Ulna and Distal Radius Fractures with a Intramedullary Angular Stable Rigid Nail System. The XS/XXS Nail

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Introduction: Indications and Implant The primary indication for a compression nail osteosynthesis was the olecranon fracture which is a typical fracture under tension. We use the XS (4,5 mm) and XXS nail (3,5 mm) with angle stable locking and compression possibility to stabilise olecranon fractures since 1999. Since then also ulna shaft and distal ulna fractures were stabilised with the XS nail. Recently a modified XS nail was introduced for angle stable fixation of Type A2,3 and C1 distal radius fractures. The XS nail insertion is similar in all indications. After anatomical reduction a guide K-Wire is introduced from the center of the biggest fragment to the medullary canal or in some fracture types into the metaphyseal area. The wire is overdrilled with a cannulated drill with diameter identical to the nail so that nail insertion is possible without tension and risk of additional fractures. Locking is done with threaded wires with the carbon nail insertion aiming device.

Material and Methods: Olecranon fractures 2000 to 2002 76 patients and from 2002-2005 49 patients with olecranon fractures were treated with the XS nail. The results were evaluated after clinical and radiological examination according to the Tegner function score, the Dash score and the Mayo score. The XS Radius nail is a anatomical adapted XS nail with angular stability and was used in 50 consecutive cases with A3 and C1 distal radius fractures in a Phase I trial.

Results: Results In the first examination period 95% and in the second period 88% of the patients had a very good or good result in the Mayo score. The Tegner functional score showed in 94% the same level of activity as compared to preoperatively. 1 patient reduced activity level by one because of retirement from heavy work to pension and one woman because of severe polyarthritis. Dash score increase over 26 was found in 5 patients, 4 of them having severe osteoarthritis. The operation technique and clinical experience in elbow dislocation fractures (Monteggia) and forearm fractures and distal ulna will be presented. The distal radius fractures healed all without deep infection. In one case a skin revision for rest of the suture was needed. In 2 cases a loss of reduction of 5-10 degrees was observed.

Conclusion: Conclusion The XS nail is a versatile implant for angle stable and compression fixation of fractures under tension but also articular and shaft fractures of small bones. The clinical results are favorable.

References: Jonas Gehr, Wilhelm Friedl: Intramedulläre Verriegelungs-Kompressionsnagelung für die Behandlung der Olecranonfraktur /Intramedullary compression nail for the treatment of olecranon fractures. Operative Orthopädie und Traumatologie 206/3 :199-213

Disclosure: No significant relationships.

T039 Biomechanical Comparison of Two New Implants, The DNP® and the XSCREW® for Unstable Extraarticular Distal Radius Fractures

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Introduction: Recently the DNP®, a dorsal locked hybrid of nail and plate and the XSCREW®, an implant combined of a cannulated screw and Kirschner-wires have been developed for internal fixation of the distal radius. These implants are thought to allow stable fixation of some fracture types by minimizing soft tissue trauma. Few biomechanical studies have been performed to compare the ability of these new devices to allow early loading and motion of the wrist joint. The purpose of the study was to compare the biomechanical stability of distal radius fracture fixation with the DNP® and the XSCREW®. **Material and Methods:** 8 pairs of fresh frozen cadaver radii were used. To simulate an unstable extraarticular distal radius fracture, an osteotomy with a 5 mm gap was made. Axial loads of -10 to -100 N and torque loads of -1,5 to 1,5 Nm were applied by a testing machine to the intact radii and to the radii after each device was fixed as recommended by the manufacturer. After that, 1000 cycles of dynamic torque load alterations of 0,5 to 1,5 Nm (or -0,5 to -1,5 Nm convenient to side) at 0,5 Hz with a preload of -10 N were performed. In the specimens that were still intact after 1000 cycles, loading in torque was continued until failure occurred. Axial and torque stiffnesses of the osteosynthesis system were calculated.

Results: With a median of 136,0 N/mm axial stiffness of XSCREW®-fixed specimens was higher than of DNP®-fixed specimens with a median of 69,5 N/mm but did not reach statistical significance. With a median of 0,163 Nm/° torque stiffness of XSCREW®-fixed specimens was significant higher than of DNP®-fixed specimens with a median of 0,068 Nm/°. The XSCREW®-group reached 33% of the axial stiffness and 49% of the torque stiffness and the DNP®-group reached 14% of the axial stiffness and 20% of the torque stiffness of the intact radii.

Conclusion: Fixation of unstable extraarticular distal radius fractures with a XSCREW® provide biomechanically more stability than a fixation with a DNP®.

Disclosure: No significant relationships.

T040 Deformity Correction with the Taylor Spatial Frame After Growth Arrest of the Distal Radius

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Introduction: Forearm fractures are one of the most common injuries in children. Growth disturbance or growth arrest of the injured physis

after distal radius fractures occur in 4% to 7% of fracture cases. The resulting deformity resembles Madelung's deformity and is also called pseudo-Madelung's deformity. This deformity leads to ulnocarpal impaction and dorsal dislocation of the distal radioulnar joint (DRUJ). Several treatment options such as lengthening of the radius and shortening of the ulna or epiphysiodesis of the distal ulna have been described. The Taylor Spatial Frame (TSF) is a hexapod based external ring fixator, which is widely used to perform six-axis deformity corrections of the lower limb. TSF-planning is web based (www.spatialframe.com) but its use is only available for lower extremities. The purpose of this study was to apply the TSF to the upper extremities to correct pseudo-Madelung deformities.

Material and Methods: Defining the nomenclature To correct bony deformities with the TSF, one must determine the deformity parameters, the frame parameters, and mounting parameters for the web based planning program. The six deformity parameters and the four mounting parameters use the anatomic nomenclature for the lower extremities. To use the TSF on the forearm, one must transfer the nomenclature of the deformity parameters and the mounting parameters to the nomenclature of the forearm. With the transferred nomenclature, one can correct forearm deformities with the correction mode Long Bone of the planning program for the lower limb. Patients Two boys (Patient 1, 13 years, Patient 2, 14 years old) and two girls (Patient 3, 8 years, Patient 4, 7 years) were seen in our clinic with progressive pseudo-Madelung deformities after an epiphyseal fracture of the distal radius at age 12 in the boys and 6 in the girls. Skeletal maturity (RUS, TW3 method) was equivalent to the patient's age. **Results:** In the four patients, the multiplanar deformity of the distal radius could be corrected anatomically with the TSF. There were no frame changes or frame modifications necessary for deformity correction. Patient 2 was slightly overcorrected because of some growth in the distal ulnar growth plate. During the distraction, each patient had two low-dose CT scans for better visualization of the radiocarpal and radioulnar joint. The web-based planning program was adjusted twice until total deformity correction was achieved. No further immobilization after frame removal was required. The one-year follow-up showed an anatomic aligned forearm/hand relation with increased pronation and supination compared to the preoperative range of motion in all patients. The wrist and especially the DRUJ were stable and reduced at the one-year follow-up examination. The patients did not complain about any pain or functional deficits in the hand.

Conclusion: In conclusion, the power of the TSF with the ability to move two fragments precisely can be transferred to the forearm. This allows for the correction of multiplanar radial deformities simultaneously without the need for frame modifications of rotational and translational deformities, as is necessary with the standard Ilizarov system.

Disclosure: No significant relationships.

T041 Comparison of Computed Tomography and Magnetic Resonance Imaging for Triage of Suspected Scaphoid Fractures

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Introduction: This study tested the null hypothesis that computed tomography (CT) and magnetic resonance imaging (MRI) have the same diagnostic performance characteristics for triage of suspected scaphoid fractures.

Material and Methods: Thirty-four consecutive patients with a suspected scaphoid fracture (post-injury tenderness of the scaphoid and normal radiographs) underwent CT and MRI within ten days after trauma. CT-reconstructions were made in planes defined by the long axis of the scaphoid. The reference standard for a true fracture of the scaphoid was 6-week follow-up radiographs in four views, based on current available evidence in the literature. A panel including surgeons and radiologists came to a consensus diagnosis for each type of imaging considered in a randomized and blinded fashion, independent of the other types of imaging. We calculated sensitivity, specificity and accuracy as well as positive (PPV) and negative predictive values (NPV) for both imaging modalities.

Results: According to the reference standard there were six true fractures of the scaphoid (prevalence 18%). CT diagnosed fracture of the scaphoid in five patients (15%), with one false positive, two false negative and four true positive results. MRI diagnosed a fracture in seven patients (21%), with three false positive, two false negative and four true positive results. Sensitivity, specificity and accuracy for CT were 67%, 96% and 91%; and for MRI 67%, 89% and 85% respectively. According to the McNemar test for paired binary data for each imaging modality these differences were not significant. The positive predictive values using Bayes' formula were 0.76 for CT and 0.54 for MRI. Negative predictive values were 0.94 for CT and 0.93 for MRI.

Conclusion: CT and MRI had comparable diagnostic characteristics. Both MRI and CT are better at ruling fractures out than in ruling them in and both were subject to false positive and false negative interpretations. The best reference standard for a true fracture is debatable, but for now it is not clear when bone edema on MRI and small unicortical lines on CT represent a true fracture. We advice CT because costs are lower and overall availability is higher.

References: Adey, L.; Souer, J. S.; Lozano-Calderon, S.; Palmer, W.; Lee, S. G.; and Ring, D.: Computed tomography of suspected scaphoid fractures. *J Hand Surg [Am]*, 32(1): 61-6, 2007. Ring, D., and Lozano-Calderon, S.: Imaging for suspected scaphoid fracture. *J Hand Surg [Am]*, 33(6): 954-7, 2008. Sanders, W. E.: Evaluation of the humpback scaphoid by computed tomography in the longitudinal axial plane of the scaphoid. *J Hand Surg [Am]*, 13(2): 182-7, 1988. Jenkins, P. J.; Slade, K.; Huntley, J. S.; and Robinson, C. M.: A comparative analysis of the accuracy, diagnostic uncertainty and cost of imaging modalities in suspected scaphoid fractures. *Injury*, 39(7): 768-74, 2008.

Disclosure: No significant relationships.

T042 Surgical Versus Conservative Treatment for Acute Scaphoid Fractures. A Systematic Review

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Introduction: The scaphoid bone is the carpal bone most commonly fractured in wrist trauma. Traditionally, non-displaced scaphoid fractures are considered by most as stable with predictable rates of healing with conservative treatment. Conversely, displaced fractures are recognised as unstable, with a significant risk of non-union if not treated surgically. There is a current trend in orthopaedic practice, however, to treat non- or minimal displaced fractures also with early open reduction and internal fixation. This trend is not evidence based. In this systematic review and meta-analysis, we pool data from trials comparing surgical and conservative treatment for acute scaphoid fractures, thus aiming to summarise the best available evidence.

Material and Methods: We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (January 2009), the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE (1966 to December 2008), EMBASE, CINAHL and reference list of articles, and contacted researchers in the field. We selected eight randomised controlled trials comparing surgical versus conservative interventions for acute scaphoid fractures in adults. Two authors independently screened titles and abstracts, reviewed manuscripts, assessed methodological quality according to the GRADE-system and extracted data. Data were pooled using fixed-effects and random-effects models with standard mean differences (SMD) and risk ratios for continuous and dichotomous variables respectively. Heterogeneity across studies was assessed with Forest plots and calculation of the I^2 statistic.

Results: Four-hundred seventeen patients were included in eight trials (205 fractures were treated surgically and 212 conservatively). Most trials lacked scientific rigor. Four studies assessed functional outcome with validated physician- and patient-based outcome instruments. With the numbers available (200 patients), we found a significant difference according to our primary outcome measure, standardised patient-based outcome (SMD = -0.68, 95% CI = [-1.00, -0.36], $p = <0.0001$, $I^2 = 18\%$) in favour of surgical treatment. With regard to our secondary parameters, we found heterogeneous results that favoured surgical treatment for grip strength, time to union and time off work. In contrast we found no significant differences between surgical and conservative treatment for pain, range of motion, rate of nonunion, malunion, and infection, rate of complications, and total treatment costs.

Conclusion: Patient-rated functional outcome and satisfaction as well as time to return to function favoured surgical treatment for acute scaphoid fractures. However, there is no evidence from prospective randomised controlled trials on physician-rated functional outcome, radiographic outcome, complication rates and treatment costs to favour surgical or conservative treatment for acute scaphoid fractures.

Disclosure: No significant relationships.

T043 A Biomechanical Analysis of Intrascaphoid Compression Achieved by Three Different Headless Compression Screws and Standard 2.0 Cortical Screw Inserted as a Lag Screw. An In Vitro Cadaveric Study

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Introduction: The purpose of this study is to evaluate the interfragmentary compression generated across a simulated fracture in cadaveric scaphoids by the new generation of headless compressive screws in comparison with a standard Synthes 2.0 cortical screw. The screws used are Acumed Acutrak Mini, Stryker TwinFix and Synthes Headless Compression Screw.

Material and Methods: Forty fresh frozen cadaver scaphoid bones have been sampled at our disposal for testing of screws. The bone density measurement of all specimens has been performed using a qCT scan. A transverse osteotomy will be performed at the waist of each scaphoid simulating a B2 fracture according to the Herbert classification. A load cell will be interposed, in an already established method, between the proximal and distal pole of the bone to measure compression force while introducing the screw. The screws will be applied as recommended by the manufacturer using original instruments. The intrascaphoid compression will be recorded at the peak during insertion of the screw, and after 30 and 60 seconds, 2, 10, 30 and 120 minutes.

Results: Preliminary results determined that a greater compression can be sustained over a time by headless compression screws with significant differences between those screws. The tests will be finished at the end of January and we will present the final results.

Conclusion: The interfragmentary compression and an exact screw placement show to have a crucial role in fracture healing. The optimal compression required to induce fracture healing is unknown.

References: 1) J.M.Haisman, R.S.Rohde, A.J.Weiland - Acute fractures of the scaphoid; J Bone Joint Surg Am. 2006;88:2750-2758 2) A.Watts, G.Bain, J.Jupiter - Metaanalysis: Nondisplaced scaphoid fractures. Operative vs. nonoperative management(update to Nov.2003 issue); Orthop. trauma dir. 2009; 01; 1-10 3) J.F. Slade III, S.D.Dodds - Minimally invasive management of scaphoid nonunions; Clinical orthopaedics and related research 2006; 445:108-119 4) I.K.Y. Lo, G.J.W. King, A.D. Milne, J.A. Johnson, D.G. Chess - A biomechanical analysis of intrascaphoid compression using the Herbert scaphoid screw system. An vitro cadaveric study; J Hand Surg (Br) 1998; 23B: 2: 209-213 5) R.A. Pensy, A.M. Richards, T.A. Knight, S.M. Belkoff, K. Mentzer, W.A. Eglseider - Comparison of the Synthes Headless Compression Screw and the Acutrak Standard Screw for scapoid fracture fixation. 62nd Annual Meeting of the American Society for Surgery of the Hand: Poster #39 6) J.T. Hausmann, W.Mayr, E.Unger, T.Benesch, V.Vescsei, C.Gaebler - Interfragmentary compression forces of scaphoid screws in a saw-bone cylinder model; Injury 2007; 38, 763-768

Disclosure: No significant relationships.

T044 The True Specificity of MR Imaging for Occult Scaphoid Fractures. False Positive Findings in Healthy Volunteers

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Introduction: MR imaging is often advocated for diagnosing occult scaphoid fractures with a specificity up to 100%. The primary aim of

this study was to verify, in a group of healthy volunteers, the true specificity of MR imaging for occult scaphoid fractures.

Material and Methods: In a prospective study, 32 healthy volunteers were recruited and both wrists were scanned. The 64 scans of healthy volunteers were mixed with 60 MR scans of suspected scaphoid fractures. The total of 124 was mixed and blinded coded. Five independent radiologists evaluated the MR scans on the presence or absence of a scaphoid fracture according to a standard protocol.

Results: Only one radiologist scored no scaphoid fracture in the group of healthy volunteers. In addition, the other four radiologists scored 13 scaphoid fractures in the 64 healthy volunteers. The overall specificity was 96% (95%CI: 0.93-0.98). The overall Kappa of the five observers was 0.4380 ($p = 0.000$).

Conclusion: The results presented are unique and reveals the true specificity of MR imaging for occult scaphoid fractures. It is surprising that only one out of the five radiologists score no scaphoid fracture in the healthy volunteers. Despite these remarkable results, the average specificity was good.

Disclosure: No significant relationships.

T045 Bone Scintigraphy Still a Good Choice to Detect Occult Fractures Around the Wrist

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Introduction: Initial radiographs only detect a proportion of all carpal fractures. Particularly scaphoid fractures can lead to serious complications and disabilities of the hand. Provided that a precise protocol is followed, a diagnostic method such as bone scintigraphy can be useful for fast detection of occult fractures. Aim: Evaluate the diagnostic value of our protocol of routine bone scintigraphy in suspected scaphoid fractures for the detection of occult secondary injuries.

Material and Methods: We evaluated 160 patients who attended our emergency department with signs of a scaphoid fracture but without radiological evidence and subsequently undergoing BS according to protocol. The result of the bone scintigraphy was compared to the final and the initial radiographs.

Results: On average, bone scintigraphy was performed after 4.5 days. It showed 31 scaphoid fractures and 52 other fractures. The distribution of the secondary injuries was: 14 distal radius fractures, 36 carpal fractures, 2 metacarpal fractures, 2 other findings.

Conclusion: In more than 50% of our cases a fracture was missed with the initial radiograph. Bone scintigraphy is still a good choice to detect an occult fracture around the wrist.

References:

1. Kozin, S.H., Incidence, mechanism, and natural history of scaphoid fractures. *Hand Clin.* 2001. 17: 515-524. 2. Groves, A.M., Kayani, I., Syed, R., Hutton, B.F., Bearcroft, P.P., Dixon, A.K., and Ell, P.J., An international survey of hospital practice in the imaging of acute scaphoid trauma. *AJR Am.J.Roentgenol.* 2006. 187: 1453-1456. 3. Beeres, F.J., Rhemrev, S.J., den, H.P., Kingma, L.M., Meylaerts, S.A., Le, C.S., Bartlema, K.A., Hamming, J.F., and Hogervorst, M., Early magnetic resonance imaging compared with bone scintigraphy in suspected scaphoid fractures. *J.Bone Joint Surg.Br.* 2008. 90: 1205-

1209. 4. Groves, A.M., Cheow, H., Balan, K., Courtney, H., Bearcroft, P., and Dixon, A., 16-MDCT in the detection of occult wrist fractures: a comparison with skeletal scintigraphy. *AJR Am.J.Roentgenol.* 2005. 184: 1470-1474. 5. Bayer, L.R., Widding, A., and Diemer, H., Fifteen minutes bone scintigraphy in patients with clinically suspected scaphoid fracture and normal x-rays. *Injury* 2000. 31: 243-248. 6. Krasin, E., Goldwirth, M., Gold, A., and Goodwin, D.R., Review of the current methods in the diagnosis and treatment of scaphoid fractures. *Postgrad.Med.J.* 2001. 77: 235-237. 7. Chakravarty, D., Sloan, J., and Brenchley, J., Risk reduction through skeletal scintigraphy as a screening tool in suspected scaphoid fracture: a literature review. *Emerg.Med.J.* 2002. 19: 507-509.

Disclosure: No significant relationships.

RESEARCH

T046 Androstenediol Modulates the Systemic Chemokines Expression in a Combined Trauma-Hemorrhage/CLP Mouse Model

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Introduction: The early overwhelming pro-inflammatory immune responses as well as the subsequent immunodepression are thought to play a significant role in the pathogenesis of posttraumatic multiple-organ-dysfunction-syndrome (MODS) and sepsis. Chemokines are known to play a significant role in the pathogenesis of these complications by recruiting immune competent cells. Sex steroids have been shown to beneficially modulate the posttraumatic immune response. The precursor Androstenediol resulted in a reduction of posttraumatic mortality in different experimental trauma models. However, the exact mechanism by which Androstendiol exerts its beneficial effects remains unknown. We therefore investigated, whether the application of Androstendiol has a effect on plasma chemokine levels in a combined trauma-hemorrhage (T-H)/CLP mouse model.

Material and Methods: T-H was induced by orbital puncture in C57BL/6 mice. 1 hour after induction of T-H animals were resuscitated with 4x the shed blood volume of Ringers solution. Sepsis was induced 48 hours later by coelical ligation and puncture (CLP). Four hours after CLP the animals were exsanguinated by cardiac puncture. From day 1 to day 3 Androstendiol (1 mg/kg body weight) was applied daily ($n = 10$), whereas the control group was treated with vehicle only ($n = 10$). Animals of the sham group were treated with vehicle or Androstendiol over a period of three days without further interventions ($n = 10$). Measurement of plasma MCP-1, MCP-3 and MIP-1 β was performed by FACS analysis (Flowxymix, BenderMed Systems). Statistical differences were detected by ANOVA on ranks and t-tests.

Results: T-H and CLP induction resulted in a significant increase of MCP-1, MCP-3 and MIP-1 β plasma levels. Application of Androstenediol led to significantly lower MCP-1, MCP-3 and MIP-1 β levels compared to vehicle-treated animals after T-H/CLP (p

Conclusion: Androstenediol can considerably modulate the immune reaction induced after trauma-hemorrhage and a septic insult by reducing the systemic levels of chemokines, which are known to direct immune cells into the tissue and hereby possibly leading to organ damage. Consequently, Androstenediol could represent a potential therapeutic agent. Further studies are needed to elucidate the beneficial mechanisms of Androstenediol on the immune response after trauma.

Disclosure: No significant relationships.

T047 Mechanical Ventilation Causes More Lung Damage than Haemorrhagic Shock in a Rat Model

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Introduction: Haemorrhagic shock is common in multi trauma patients. Shock can activate the immune system and induce a systemic inflammatory response. The activation of the immune system is signified by primed polymorph neutrophil granulocytes (PMN). Multi trauma patients often require mechanical ventilation that can cause both pulmonary and systemic inflammation. The aim of this study is to evaluate a possible synergistic effect of haemorrhagic shock and positive pressure ventilation (PPV) on the development of systemic inflammation in rats.

Material and Methods: Thirty male Sprague-Dawley rats were randomised for shock either with or without PPV. Eighteen rats underwent haemorrhagic shock during 30 minutes (30% volume loss via carotid artery catheter). After that they were resuscitated for an hour with sham blood and normal saline. Six of the eighteen rats were tracheotomised and ventilated with low volume ventilation (LV; PEEP 5 cm H₂O, Pressure Controlled +10 cm H₂O, FiO₂ 0.33), six with high volume ventilation (HV; PEEP 5 cm H₂O, Pressure Controlled +20 cm H₂O, FiO₂ 0.33) and the other six were not mechanically ventilated, but sedated titrated to sufficient spontaneous respiration. The twelve remaining rats had either LV or HV ventilation without shock. Rats were terminated after 5 hours by drawing blood from the right cardiac ventricle. Heart and lungs were harvested and a bronchoalveolar lavage (BAL) was performed. BAL fluids and blood were collected to calculate PMNs percentages (numbers are expressed in means +SEM, P < 0.05 = statistically significant).

Results: The venous blood sample of the LV ventilated rats showed 65 + 4% PMNs compared to 68 + 2% in the HV ventilated group. Rats shocked without PPV had 51 + 7% PMNs, LV + shock 61 + 5% and HV + shock 57 + 8%. These differences are not sta-

tistically significant. HV ventilation alone causes significantly more PMNs in BAL fluids (37 + 11%) than LV ventilation alone (15 + 4%) or shock alone (6 + 3%). BAL fluids of LV + shock group had 22 + 7% PMNs and the HV + shock group showed 26 + 7% PMNs. This is significantly more than shock alone, but not statistically significant different compared to LV or HV ventilation alone.

Conclusion: HV ventilation leads to significantly more PMNs in BAL fluid than shock alone or shock in combination with PPV. These results both show the importance of local damage for development of a systemic inflammatory response and that shock alone is not enough to activate this systemic inflammation.

Disclosure: No significant relationships.

T048 Toll-like Receptor 2 (TLR) Agonist Macrophage Activating Lipopeptide 2 (MALP) Improves Survival in a Murine Sepsis Model

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Introduction: Effective treatment of polymicrobial sepsis is still a major problem on intensive care units worldwide. The overwhelming immuneresponse, particularly caused by macrophages and mediated via Toll-like receptors (TLR), plays a pivotal role in the pathogenesis of sepsis. Previous studies showed, that TLR-2 agonists such as macrophage activating lipopeptide 2 (MALP-2) reduced mortality in mice most likely through cross-tolerance when administered 4 days prior to sepsis induction. In the present study the hypothesis was tested whether the TLR-2 and 6 pathway can also be used as a therapeutic agent parallel to sepsis induction and several hours thereafter.

Material and Methods: MALP-2 was administered parallel to sepsis induction via caecal ligation and puncture (CLP). Mortality, activity, chemokine plasma levels, chemokine levels of cultured alveolar macrophages and pulmonary infiltration of polymorphnuclear leukocytes (PMN) were determined. In addition, mortality was analysed when MALP-2 was administered 6 h after CLP. Vehicle treated animals served as controls.

Results: Our study demonstrated, that MALP-2 treatment resulted in a significantly improved survival rate as well as reduced monocyte chemoattractant protein (MCP)-1 levels in the plasma. Furthermore altered pulmonary infiltration by neutrophils and reduced proinflammatory chemokine levels in cultured pulmonary macrophages were detected (p

Conclusion: These results demonstrate a beneficial effect of MALP-2 as a therapeutic agent in polymicrobial sepsis in a murine sepsis model when administered parallel to sepsis onset and 6 h after sepsis induction. Possible mechanisms may be an improved bacterial

clearance rather than cross tolerance as demonstrated after prophylactic administration of MALP-2.

References:

- 1.Christaki E, Opal SM: Is the mortality rate for septic shock really decreasing? *Curr Opin Crit Care* 14:580-586, 2008.
- 2.Russel JA: The current management of septic shock. *Minerva Med* 99:431-458, 2008.
- 3.Lenz A, Franklin GA, Cheadle WG: Systemic inflammation after trauma. *Injury* 38:1336-1345, 2007.
- 4.Deiters U, Gumenscheimer M, Galanos C, Muhlradt PF: Toll-like receptor 2- and 6-mediated stimulation by macrophage-activating lipopeptide 2 induces lipopolysaccharide (LPS) cross tolerance in mice, which results in protection from tumor necrosis factor alpha but in only partial protection from lethal LPS doses. *Infect Immun* 71:4456-4462, 2003.
- 5.Luhrmann A, Deiters U, Skokowa J, Hanke M, Gessner JE, Muhlradt PF, Pabst R, Tschernig T: In vivo effects of a synthetic 2-kilodalton macrophage-activating lipopeptide of *Mycoplasma fermentans* after pulmonary application. *Infect Immun* 70:3785-3792, 2002.
- 6.Sato S, Nomura F, Kawai T, Takeuchi O, Muhlradt PF, Takeda K, Akira S: Synergy and cross-tolerance between toll-like receptor (TLR) 2- and TLR4-mediated signaling pathways. *J Immunol* 165:7096-7101, 2000.
- 7.Salomao R, Martins PS, Brunialti MK, Fernandes Mda L, Martos LS, Mendes ME, Gomes NE, Rigato O: TLR signaling pathway in patients with sepsis. *Shock* 30 Suppl 1:73-77, 2008.
- 8.Feterowski C, Novotny A, Kaiser-Moore S, Muhlradt PF, Rossmann-Bloek T, Rump M, Holzmann B, Weighardt H: Attenuated pathogenesis of polymicrobial peritonitis in mice after TLR2 agonist pre-treatment involves ST2 up-regulation. *Int Immunol* 17:1035-1046, 2005.
- 9.Barkhausen T, Probst C, Hildebrand F, Pape HC, Krettek C, van Griensven M: Insulin therapy induces changes in the inflammatory response in a murine 2-hit model. *Injury* 2009. PMID: 19167710.
- 10.Muhlradt PF, Kiess M, Meyer H, Sussmuth R, Jung G: Isolation, structure elucidation, and synthesis of a macrophage stimulatory lipopeptide from *Mycoplasma fermentans* acting at picomolar concentration. *J Exp Med* 185:1951-1958, 1997.
- 11.Tsujimoto H, Ono S, Efron PA, Scumpia PO, Moldawer LL, Mochizuki H: Role of Toll-like receptors in the development of sepsis. *Shock* 29:315-321, 2008.
- 12.Van Amersfoort ES, Van Berkel TJ, Kuiper J: Receptors, mediators, and mechanisms involved in bacterial sepsis and septic shock. *Clin Microbiol Rev* 16:379-414, 2003.
- 13.Bossink AW, Paemen L, Jansen PM, Hack CE, Thijs LG, Van Damme J: Plasma levels of the chemokines monocyte chemoattractant proteins-1 and -2 are elevated in human sepsis. *Blood* 86:3841-3847, 1995.
- 14.Bozza FA, Salluh JJ, Japiassu AM, Soares M, Assis EF, Gomes RN, Bozza MT, Castro-Faria-Neto HC, Bozza PT: Cytokine profiles as markers of disease severity in sepsis: a multiplex analysis. *Crit Care* 11:R49, 2007.
- 15.Frink M, Lu A, Thobe BM, Hsieh YC, Choudhry MA, Schwacha MG, Kunkel SL, Chaudry IH: Monocyte chemoattractant protein-1 influences trauma-hemorrhage-induced distal organ damage via regulation of keratinocyte-derived chemokine production. *Am J Physiol Regul Integr Comp Physiol* 292:R1110-1116, 2007.
- 16.Ramnath RD, Ng SW, Guglielmotti A, Bhatia M: Role of MCP-1 in endotoxemia and sepsis. *Int Immunopharmacol* 8:810-818, 2008.
- 17.Wang Z, Rui T, Yang M, Valiyeva F, Kvietys PR: Alveolar macrophages from septic mice promote polymorphonuclear leukocyte transendothelial migration via an endothelial cell Src kinase/NADPH oxidase pathway. *J Immunol* 181:8735-8744, 2008.
- 18.Maurer M, von Stebut E: Macrophage inflammatory protein-1. *Int J Biochem Cell Biol* 36:1882-1886, 2004.
- 19.Standiford TJ, Kunkel SL, Lukacs NW, Greenberger MJ, Dan-

forth JM, Kunkel RG, Strieter RM: Macrophage inflammatory protein-1 alpha mediates lung leukocyte recruitment, lung capillary leak, and early mortality in murine endotoxemia. *J Immunol* 155:1515-1524, 1995.
- 20.Hsieh CH, Frink M, Hsieh YC, Kan WH, Hsu JT, Schwacha MG, Choudhry MA, Chaudry IH: The role of MIP-1 alpha in the development of systemic inflammatory response and organ injury following trauma hemorrhage. *J Immunol* 181:2806-2812, 2008.
- 21.van Griensven M, Probst C, Muller K, Hoevel P, Pape HC: Leukocyte-endothelial interactions via ICAM-1 are detrimental in polymicrobial sepsis. *Shock* 25:254-259, 2006.
- 22.Abraham E, Carmody A, Shenkar R, Arcaroli J: Neutrophils as early immunologic effectors in hemorrhage- or endotoxemia-induced acute lung injury. *Am J Physiol Lung Cell Mol Physiol* 279:L1137-1145, 2000.
- 23.van Griensven M, Kuzu M, Breddin M, Bottcher F, Krettek C, Pape HC, Tschernig T: Polymicrobial sepsis induces organ changes due to granulocyte adhesion in a murine two hit model of trauma. *Exp Toxicol Pathol* 54:203-209, 2002.
- 24.Kaufmann A, Muhlradt PF, Gerns D, Sprenger H: Induction of cytokines and chemokines in human monocytes by *Mycoplasma fermentans*-derived lipoprotein MALP-2. *Infect Immun* 67:6303-6308, 1999.
- 25.Reppe K, Tschernig T, Luhrmann A, van Laak V, Grote K, Zemlin MV, Gutbier B, Muller HC, Kursar M, Schutte H, Rosseau S, Pabst R, Suttrop NW, Witznath M: Immunostimulation with macrophage-activating lipopeptide-2 increased survival in murine pneumonia. *Am J Respir Cell Mol Biol* 40:474-481, 2008.

Disclosure: No significant relationships.

T049 The Inflammatory Response to Intramedullary Nailing of the Femur with a Traditional Reaming System Compared to a One-step Irrigator-Aspirator Reaming System. Results from an Animal Study

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Introduction: Operations in trauma patients represent a second insult and the extent of the surgical procedures influences the extent of the inflammatory response. The aim of this study was to evaluate the operative burden related to femoral intramedullary nailing. Our hypothesis was that a reamer-irrigator-aspirator (RIA) system would cause lesser inflammatory response than traditional reaming (TR) due to a lesser intramedullary pressure increase and thereby reduced intravasation of bone marrow content.

Material and Methods: Coagulation, fibrinolysis and cytokine responses were studied in Norwegian landrace pigs during and after intramedullary reaming and nailing with the two different reaming system; the TR (n = 8) and the RIA (n = 7) reaming system, and compared to a control group (n = 7). The animals were followed for 72 hours. Simultaneously arterial, mixed venous and femoral vein blood were withdrawn peroperatively and until two hours after the nail was inserted for demonstration of pulmonary, systemic and local activation.

Results: Significantly procedure-related increased levels were found for TAT, t-PA and IL-6 in the TR group and TAT in the RIA group.

The local and the pulmonary activation of coagulation, fibrinolysis and cytokine response was more pronounced in the TR than in the RIA group, but the difference did only reach significance for IL-6 (femoral vein) and PAI-1 (arterial). The arterial levels of IL-6 and TAT exceeded the mixed venous levels indicating an additional pulmonary activation. These differences, however, did not reach significance. Two animals in the TR group, who died prior to planned study end point, demonstrated higher inflammatory response compared to rest of the TR group.

Conclusion: The inflammatory response to the reaming and nailing procedure was modest, and the response was lesser in the RIA group than in the TR group.

References: Baigrie RJ, Lamont PM, Kwiatkowski D, Dallman MJ, Morris PJ. Systemic cytokine response after major surgery. *Br J Surg* 1992;79:757-60. Nicholson G, Woodfine J, Bryant AE, Macdonald IA, Bircher MD, Grounds RM, et al. The hormonal and inflammatory responses to pelvic reconstructive surgery following major trauma. *Injury* 2005;36:303-9. van Deuren M, Twickler TB, de Waal Malefyt MC, Van Beem H, van der Ven-Jongekrijg J, Verschuereen CM, et al. Elective orthopedic surgery, a model for the study of cytokine activation and regulation. *Cytokine* 1998;10:897-903. Husebye EE, Lyberg T, Madsen JE, Eriksen M, Roise O. The influence of a one-step reamer-irrigator-aspirator technique on the intramedullary pressure in the pig femur. *Injury* 2006;37:935-40.

Disclosure: No significant relationships.

T051 Maggot Excretions Enhance the Antibacterial Activity of Antibiotics

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Introduction: Maggots of *Lucilia sericata* are successfully used to heal severe infected wounds and osteomyelitis¹. In this study the effect of maggot excretions/secretions (ES) on the antibacterial activity of different antibiotics was tested.

Material and Methods: Minimal inhibitory concentrations (MIC) and minimal bactericidal concentrations (MBC) of gentamicin and flucloxacillin for *Staphylococcus aureus*, of penicillin for *Streptococcus pyogenes*, of amoxicillin and vancomycin for *Enterococcus faecalis*, of gentamicin for *Enterobacter cloacae*, and of gentamicin, tobramycin and ciprofloxacin for *Pseudomonas aeruginosa* were determined. The MIC and MBC of every bacterium and antibiotic alone were determined. Then, by checkerboard titration, a range of concentrations of antibiotics was investigated in combination with ES and the MIC and MBC were compared. A start inoculum of 5×10^6 bacteria/mL was used.

Results: The results show that gentamicin in presence of ES enhance dose-dependently the antibacterial effect of gentamicin against *S. aureus* ($p < 0.0001$). In presence of ES, MIC and MBC of gentamicin decrease 32-fold. Maggot ES did not reduce the MIC of flucloxacillin for *S. aureus*, though the MBC was four times lower in the presence of 50 µg ES/well ($p < 0.0001$). The other ES/antibiotic combinations

showed no synergistic or antagonistic effect. Results of previous research showed that ES alone do not possess antibacterial properties.

Conclusion: The enhanced antibacterial activity of gentamicin in presence of ES can be of direct importance in clinical practice, because a very low concentration of gentamicin is bactericidal in presence of ES and thus the risk of gentamicin side-effects (nephrotoxicity and hearing loss) can be decreased. The mechanism behind the synergisms between flucloxacillin/ES and gentamicin/ES and the possible indirect antibacterial properties of maggots and/or their ES are the current topics of interest in our research group.

References: ¹ Steenvoorde P, Jukema GN. The antimicrobial activity of maggots: in-vivo results. *J Tissue Viability*. 2004 14:97-101.

Disclosure: No significant relationships.

T052 Premature Failure of the ABG-1-Uncemented Acetabular Cup in Hip Arthroplasty: Cause Study and Interdisciplinary Failure Analysis

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Introduction: Approximately 1.5 million joint arthroplastic operations are performed annually worldwide. Implant failure due to massive bone loss and aseptic prosthesis loosening, however, is a major complication of joint replacement. It is generally accepted that small particles ("wear debris") and activated macrophages play a key role in aseptic loosening. But also the Prosthesis Loosening Fibroblast (PLF) plays an important role.

Material and Methods: Between 1992 and 1998 208 ABG-1- hip arthroplasties were implanted. After a 7 year analysis 40% had to be removed because of massive wear of polyethylene (PE) and consecutive acetabular osteolysis. We analysed the influence of patient and surgeon, the implantdesign incl. PE-thickness, anchorage coupler, material roughness i.e. and the material i.e. CoCr, Hydroxyapatite and PE. Further we stimulate human fibroblasts and stem cells with PE wear.

Results: The implantdesign and the PE were of very bad quality and lead to a massive PE wear and consecutive osteolysis. Further we could show that the molecular reaction of the PLF was very similar to rheumatoid arthritis. There was very high expression of MMP-1, MMP-14, Kath. K and IL-6.

Conclusion: We could show that PLF play as well a key role in aseptic loosening of orthopaedic implants similar to rheumatoid arthritis. Further the implant design lead to the catastrophic premature failure.

References: Drees P, Eckardt A, Gay S, Huber L. Mechanism of Disease: molecular insights of aseptic loosening orthopaedic implants. *Nature Clin. Pract. Rheum.* 2007 Mar; 3(3) 165-71

Disclosure: No significant relationships.

T053 Calcium Phosphate Cement Kyphoplasty Micro. Morphological Distribution Pattern Analysis of Injectable CaP Cements

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Introduction: The development of injectable calcium phosphate cements enabled the use of these bio-degradable augmentation biomaterials during kyphoplasty. After application of the viscous paste into the bony defect, sedimentation and hardening occurs. The goal of this investigation was a comparison of commercially available, clinically used, injectable calcium phosphate cements.

Material and Methods: The following calcium phosphate cements were used: Norian SRS (Synthes), BoneSource (Stryker), Calcibon (Biomet), ChronOS inject (Synthes) and KyphOs FS (Kyphon/Medtronic). The application of the cements was done according to the specifications of the manufacturer. After extrapedicular kyphoplasty on cadaveric lower thoracic spine vertebrae (Th 6-12), the intervertebral distribution pattern was investigated by microtomography (µCT). Besides creating high resolution 2D and 3D reconstructions, the mathematic calculation of the porosity of the vertebra, the bone substitute material and the relative part within the different compartments was performed. Of special interest were the characterization of the bone substitute material - spongiosa - interface and the penetration of the calcium phosphate cement into the adjacent spongiosa. The following parameters were investigated: 1. Trabecular structure, porosity and hydroxylapatite concentration of the native vertebrae 2. Structure (homogeneity, distribution of pores) of the bony substitute material 3. Characterization of the bone- bone substitute- interface a. Central located, filled kyphoplasty defect b. Transition zone with spongiosa and bone substitute material c. Solitary spongy bone

Results: The investigation of the native spongiosa yielded a comparable trabecular structure, porosity and hydroxylapatite concentration in the intra-individual comparison of the vertebrae of the lower thoracic spine. Between the cements differences in the solitary structure as well as distribution pattern during kyphoplasty were observed. Especially the analysis of the ability to penetrate into the spongiosa adjacent to the centrally located kyphoplasty defect yielded significant differences.

Conclusion: The main influencing factor of the ability to penetrate into the spongiosa is the different viscosity of the - according to manufacturer specification - used calcium phosphate cements. The cements differ in their native structure as well as in their distribution pattern during kyphoplasty. The differences in micro-morphology of the calcium phosphate cements have a high probability to influence the degradation of the sedimentation products and later osseointegration.

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ACETABULUM

T054 The Influence of Modifiers on Outcome of Acetabular Fractures

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Introduction: It is difficult to predict the long-term clinical outcome in the early period following an acetabular fracture. The aim of this study was to examine if the presence of the so-called modifier (subchondral impaction, intra-articular fragments, comminution at the fracture site and osteochondral injuries to the femoral head) have an influence on the late clinical outcome after reconstruction of acetabular fractures.

Material and Methods: We report our clinical and radiological results in 77 patients who completed minimum follow-up of 12 months (range 12 – 101 months). The average follow-up was 45 months. The average age of patients was 45 years (range 14 - 79 years). The average time to surgery was 4 days (range 1-15 days). The average operation time was 148 minutes (range 65 – 438 minutes). The ilio-inguinal approach was chosen in 41, the Kocher-Langenbeck approach in 36 patients. Following the Letournel classification, the most frequent lesions were posterior wall (n = 20; 26%), two-column (n = 17; 22,1%) and anterior column (n = 11; 14,3%). Modifiers could be identified in 38 of 77 fractures (49.4%). Subchondral impaction was seen in 27 fractures (35.1%), comminution at the fracture site in 15 (19.5%), intra-articular fracture fragments in 8 (10.4%) and osteochondral injuries to the femoral head in 3 (3.9%). All data were analysed using SPSS version 15 (SPSS Inc., Chicago, Illinois)

Results: Following the scoring system of Merle d'Aubigné, fifteen patients had an excellent (19.5%), thirty-nine a good (50.7%), fifteen patients a moderate (19.5%) and eight a bad (10.3%) result. In accordance with the Harris hip scoring system 29 patients (37.7%) achieved an excellent result, 26 (33.8%) a good, nine (11.7%) a moderate and thirteen (16.9%) a bad result. Forty patients (51.9%) had no radiological signs of hip arthrosis, twelve grade one (15.6%), ten grade two (13%), two grade three (2.6%) and five grade four (6.5%) in the arthrosis grading system of Epstein. Eight patients underwent total hip replacement (10.4%) Twenty of twenty-two (Merle-d'Aubigné score) and nineteen of twenty-two (Harris Hip Score) patients (90.1% respectively 87%) with moderate or bad results had one or more modifiers at primary surgery. Only three patients with the presence of modifiers could achieve an excellent result in the scoring of Merle d'Aubigné. The result of the statistical analysis shows that the presence of modifier has a highly significant association with suboptimal outcome (p < 0,05).

Conclusion: The presence of fracture modifiers significantly worsens prognosis after reconstruction of acetabular fractures. This should be communicated to the patient after analysis of the fracture characteristics.

Disclosure: No significant relationships.

T055 Reduction of Dome Impaction and Quadrilateral Surface Determines Outcome in Acetabular Fractures Treated Through Stoppa Approach

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Introduction: The ilioinguinal (II) approach is well established for the treatment of acetabular fractures. As an alternative modified Stoppa approach can be used to expose acetabular fractures. We describe our experience with this approach.

Material and Methods: This retrospective study describes a series of 50 consecutive patients of two level one trauma centers (oct 2005-sept 08; 9 multiply injured patients) where a modified Stoppa approach (n = 15), or in combination with the first window of II (n = 22) or Smith-Peterson approaches (13) was used. In 5 patients additional posterior approach was necessary. Displacement of ≤ 1 mm was considered an anatomic reduction. Functional outcome was measured by Merle d'Aubigne/Postel-score. The patient collective was divided according the age in two groups: < 60 (I), ≥ 60 years (II).

Results: The mean age in group I was 39.7, in group II 72.5 years. Of the 50 fractures, the mean time from injury to surgery was 4.5 days. Medial displacement of quadrilateral surface and dome impaction were observed in group I in 62% and 15%, and in group II in 92% and 50%. Anatomic reconstruction was achieved in 81% in group I and in 58% in group II. Eight patients had a total of nine operative complications, four required reoperation (two deep infections, one intraarticular screw, one removal of tamponade after diffuse bleeding). Two patients of the group II died within one respectively nine months after surgery. Two patients in group I and one patient in group II needed hip arthroplasty 16.7 months after reconstruction. At last clinical examination, the functional rating of 20 patients in group I and of 16 patients in group II was classified as excellent or good in 100% (11 months) respectively 69% (10 months).

Conclusion: Open reduction and internal fixation of dome impaction and quadrilateral surface through the Stoppa approach is a demanding technique. Reduction of the superomedial dome impaction eventually with bone grafting improves outcome in patients with acetabular fractures in young as well as in older osteopenic patients.

Disclosure: No significant relationships.

T056 Treatment of Traumatic Hip Dislocations Associated with Acetabular Fractures

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Introduction: Traumatic dislocation of the hip is an extremely severe injury. Although previously considered an uncommon lesion, it now is seen more often as result of MVA. In most cases this injury can result in a high incidence of complications. Early diagnosis, in polytrauma patient too, and a early closed reduction constitute the gold standard of a proper treatment of this injury.

Material and Methods: 369 pz with surgical acetabular fracture have been selected in 70 months period 249 (67.4%) were male and 120 (32.6%) female. Average age is 38.2 yo. (80.6% > 20 yo < 60 yo). In the present study 126 pz (34.14%) with hip dislocation associated

with acetabular fracture were included. 71pz (56.34%) were posterior wall fxt, 2 (1.59%) posterior column fxt, 3 (2.38%) posterior wall + posterior column, 1 (0.79%) pure transverse fxt, 24 (19.05%) transverse + pw fxt. 101 pz (32.6%) have a posterior fracture-dislocation, 21 (6.7%) central and 4 (1.2%) anterior. Average follow-up was 62 months (min 18; max 114). Every pz received an early closed reduction.

Results: In 79 pz (62.69%) we obtain a stable and concentric closed reduction. In 2 cases of uncommon pattern of postero-superior wall fracture (1.59%) occur a secondary dislocation, in 17 pz (13.49%) the hip remains unstable, 1 pz (0.79%) have an associated femoral neck fracture, 13pz of posterior column plus posterior wall and transverse plus posterior wall fractures (10.31%) after closed reduction of the posterior dislocation we obtain a central dislocation. 21pz (16.6%) received closed reduction > 6 h. 6pz (28.5%) on the whole 21pz that received a delayed reduction have developed AVN. 105pz (83.4%) received closed reduction < 6 h. 2pz (1.9%) on the whole 105pz developed AVN. The average AVN rate in our study was 6.3% with 8 cases of AVN on 126 acetabular fracture-dislocation.

Conclusion: In summary, this study suggest: (a) There are two different mechanism of intra-articular incarceration of bone fragments: i) Primary incarceration with one or several fragments, perhaps pedunculated to the capsule that enter the acetabulum at the moment of injury ii) Secondary incarceration with fragments maintaining a capsular flap pedicle that is drawn into the joint during the closed reduction; (b) Early closed or open reduction < 6 h constitute the gold standard of a proper treatment of this injury reducing the AVN rate of approximately 15 times.

References: J. B. Lippincott Company, 1945. BANKS, S. W. : Aseptic Necrosis of the Femoral Head Following Traumatic Dislocations of the Hip. CAMPBELL, W. C. : Posterior Dislocation of the Hip with Fracture of the Acetabulum. J. Bone and Joint Surg., 18: 842-850, Oct. 1936. FAHEY, J. J. : Progress in Orthopedic Surgery for 1945. IV. Conditions Involving the Hip Joint. Arch. Surg., 54: 191-201, 1947. URIST, M. R. : Fracture-Dislocation of the Hip Joint. The Nature of the Traumatic Lesion, Treatment, Late Complications, and End Results. J. Bone and Joint Surg., 30-A: 699-727, July 1948. VOL. 36-A. NO. 2, APRIL 1954

Disclosure: No significant relationships.

T057 Acetabular T-type Fractures: Evaluation of 15 Consecutive Cases

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Introduction: Acetabular T-type fractures (AO/ASIF classification B2), which only occur occasionally, are difficult to treat by open reduction and internal fixation. They present a great challenge even for experienced surgeons, because achieving anatomic reduction is really demanding. In our retrospective study we focused on the radiographic outcome and postoperative complication rate of this specific fracture type. Furthermore, we compared our results with those of Matta, published in 1996. To our knowledge his paper is the

only one available documenting the subdivided outcome of B2 fractures.

Material and Methods: Among 104 consecutive cases of acetabular fractures which were treated at a Level I trauma center between 2002 and 2007, 15 (14 %) were classified as B2. This value is comparable to the 9.3 % of Giannoudis' Meta-Analysis. The surgeries were performed by two experienced surgeons via the Kocher-Langenbeck-Approach. After an average of 11 months postoperatively the radiographic outcome was evaluated by plain X-rays and CT-scans using the Matta system, the Epstein classification and the Brooker grades. Post-traumatic arthrosis and avascular necrosis of the femoral head were documented. The complication rate was analyzed by medical records.

Results: With 26.5 % anatomic, 47 % imperfect and 26.5 % poor reduction our results did not differ significantly from those of Matta ($p = 0.27$). The appearance of the hip joint was classified "excellent" in 20 %, "good" in 20 %, "satisfactory" in 27 % and "poor" in 33 %. No heterotopic ossification was detected in 47 %, whereas grade I was observed in 27 %, grade II in 13 % and grade III in 13 %. Post-traumatic arthrosis was found in 47 % and avascular necrosis of the femoral head in 13 %. As complications temporary (20 %) and persistent (7 %) nerve damage and extensive blood loss (27 %) were observed. No case of infection, deep venous thrombosis, pulmonary embolism, malposition of the implant, haematoma, seroma, non-union or implant dysfunction occurred. Secondary surgery was needed in 13 % due to avascular necrosis of the femoral head. Between Matta grades and post-traumatic arthrosis as well as between Matta grades and surgery time a moderate correlation was calculated ($\rho = 0.549$; $\rho = 0.634$).

Conclusion: In many patients with an acetabular T-type fracture the hip joint can be preserved and post-traumatic arthrosis can be avoided if an anatomic reduction is achieved.

References: Matta J. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *J Bone Joint Surg (Am)* 1996;78:1632-1645. Giannoudis PV, Grotz MRW, Papakostidis C, Dinopoulos H. Operative treatment of displaced fractures of the acetabulum. A meta-analysis. *J Bone Joint Surg (Br)* 2005; 87-B: 2-9

Disclosure: No significant relationships.

T058 A New Developed Compined Reduction-Fixation-System for Acetabular Fractures. A Biomechanical Investigation and Analysis

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Introduction: The tremendous increase of acetabular fractures in the elderly provides new challenges for the surgical treatment of acetabular fractures. Surgical reduction of the acetabular joint represents the most reliable possibility to prevent the development of

premature arthrosis even in the elderly. Biomechanical studies showed, that plates with periarticular long screws result in an increased stability of the osteosynthesis, it has to be considered that the insertion of these screws always bears the risk of penetrating the joint. The aim of this study was to evaluate the biomechanical properties of these standard plates and newly developed minimal invasive osteosynthesis techniques for stabilization of an anterior column combined with posterior hemitransverse fracture type (ACPHTF), which represents a typical acetabular fracture in the elderly.

Material and Methods: Using a single-leg stance model we analyzed 3 different implant systems for the stabilization of ACPHTFs in synthetic pelvises (standard reconstruction plate, new developed prototype and definitive RepoFix[®] (ADI – AO Foundation, Switzerland). Applying an increasing axial load in a biomechanical testing machine, fracture dislocation was analyzed with a multidirectional ultrasonic measuring system (Zebris, Germany). Differences in change of center of gravity are statistical analysed by Mann-Whitney-U – Test.

Results: Analog to a long bow, the RepoFix[®] supports the quadrilateral surface sufficiently and reconstructs the surface of the pelvic brim from the inner side of the pelvis. In synthetic pelvises, the new RepoFix[®] is associated with a significantly less pronounced dislocation (center of gravity) of the fractured quadrilateral surface when compared to prototype and the standard reconstruction plate. The biomechanical results could be seen at a measuring point at the quadrilateral surface and in the rotation around the X – axis (angle Y).

Conclusion: In the past, only a few biomechanical studies have analyzed stabilization methods of acetabular fractures. Our results are consistent with a biomechanical study conducted by Sawaguchi et al. in 1984¹. They demonstrated that a stable fracture fixation can only be achieved with a reconstruction plate fixing both columns. This plate is usually inserted via an ilioinguinal approach. In contrast, the new RepoFix[®] may also be implanted by using an extraperitoneal approach (Stoppa approach²). The application of the new RepoFix is associated with minor invasive surgery and statistical comparably in retention forces of the fracture when compared to ACPHTF stabilization with the standard plate. The RepoFix[®] allows minimal invasive surgery in acetabular fractures compared with reduction + fixation in one step.

References: Sawaguchi Acta Orthop Scand 1984;55(6):601-5. Stoppa RE World J Surg 1989;13(5):545-54.

Disclosure: No significant relationships.

T059 The Effects of 3D-Navigation on the Operative Management and the Early Clinical Outcome of Displaced Acetabular Fractures

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Introduction: Operative treatment of displaced acetabular fractures is technically demanding and good postoperative results cannot always be achieved. With development of navigation systems and modern 3D image intensifiers new intraoperative tools are available

that may help improve intraoperative control and consecutively postoperative results. The aim of this study was to find out if the intraoperative procedure and/or the postoperative results are influenced by implementing these intraoperative tool in the surgical procedure

Material and Methods: Contributing to the national German pelvic fracture registry all acetabular fractures treated at our university hospital since 01/2004 were followed up prospectively. From 10/2006 on acetabular fractures were stabilised utilizing a navigation system and a 3D image intensifier. Previously, all operations were performed with the help of a conventional image intensifier. Data collection included demographic parameters, approach, skin-to-skin time, perioperative complications and postoperative radiological results.

Results: We collected data on 68 acetabular fractures. A conventional image intensifier was used in 37 cases (Group A), 3D-navigation was used in 31 cases (Group B). In Group A the Kocher-Langenbeck-Approach was used in most of the cases (59%), followed by the Maryland-Approach (27%). In Group B, the Kocher-Langenbeck-Approach and the Ilio-Inguinal-Approach were used in an almost equal number of patients (32% / 35%), but extended approaches were only used twice. In 28% of the cases in Group B fractures were stabilised by navigated placement of percutaneous lag screws. When we excluded the percutaneous operations in group B (n = 8), the difference in OR-time between navigated (n = 23, 365 ± 129 min) and conventional treatment (n = 37, 264 ± 100 minutes) was significant (p < 0,001). In group A we detected relevant postoperative complications in 35% of patients. The complication rate was significantly lower in group B (4%, p < 0,006). The postoperative radiological analysis revealed a better quality of reduction in group B (n = 23) with an average post-op fracture gap of 0,34 mm vs 1,58 mm in group A (p < 0,025).

Conclusion: By using a navigation system and a 3D image intensifier we found a significant increase in the OR-time in the navigated group. However, in the postoperative radiological analysis, we detected a better quality of fracture reduction in the navigated group. Navigation in combination with the 3-dimensional pictures of the ISO-C 3D led to a better visualisation of the acetabulum, therefore the need for extended approaches was reduced. To our opinion, this explains the significant reduction of postoperative complications in group B. We conclude that navigation and a 3D image intensifier should always be used for ORIF of acetabular fractures.

Disclosure: No significant relationships.

T060 TraumArt: A Computer Assisted Planning System for Orthopedic-Trauma Surgery

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Introduction: Background: Highly complex pelvic and acetabular fractures require surgical interventions which mandate specific experience and proficiency. The preparation of mechanical model [using a Finite Element Analysis (FEA)] before surgery is feasible to promote optimal surgical solution. A computerized system (JMed) is presented to facilitate the above process.

Material and Methods: Methods: The system builds up from different modules with special tasks. The first module segments the bone from the gray scale CT scans. Then the 3D structure is constructed from

the segmented volume model. A mesh simplification algorithm is developed to eliminate the complexity of the surface. A surgical planner is created in the fourth module, where distinct procedures can be tested. The 3D editing function like slicing, drilling and implant insertion are visualized. The surgeon applies forces to the model and exports the data to the FEA system. Several countries surgeons gave their data and opinion to develop this system. We will show different Pelvic and Acetabular cases based on TraumArt modeling.

Results: Results: The implemented system is functioning. The average time to create geometric and mechanical models is ~ 5 minutes including the user interactions. FEA takes 6 minutes (pelvis 3D volume study, 2 GHz PC, with 1,5 GB RAM).

Conclusion: Conclusion: This method offers new possibilities that complement current visual analytic methods and it will have great perspective in the postgraduate education. Discussion: Several complications could be avoided by JMed, while more scrupulous and prompt assessment capabilities could be provided for surgeons.

Disclosure: No significant relationships.

T061 Is there a Role of Intra-Operative Cell Salvage (ICS) in Acetabular Surgery?

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Introduction: Allogenic blood transfusion is unavoidable in a number of patients after acetabular fractures. The key elements to be taken into consideration are the pre-operative haemoglobin and the anticipated peri-operative blood loss. Another alternative could be Intraoperative Cell Salvage (ICS). Each 250 mls of salvaged and washed red cells is equivalent to one unit concentrated red cells. The aim of the project is to audit the blood loss and transfusion requirements and determine the practicality of using ICS.

Material and Methods: A pilot study of thirty patients who have undergone acetabular fracture fixations.

Results: Pre and postoperative haemoglobin levels were collected along with blood loss; intra-operatively and via drains was analysed. Most of the patients (n = 8) had 4 units requested preoperatively. The average age of the patients was 30-40 years (mean 43.85) and one third of the sample was males. Pre-operative haemoglobin ranged between 10-13 mg/dl (mean 11.26) with 4 patients (13.3%) with haemoglobin under 9.0 gm/dl. The lowest post operative haemoglobin levels averaged 9.71 mg/dl. The intraoperative blood loss (mean 117.67) has been within 200 mls and a further fluid loss through drains has averaged 45.33 mls. Postoperative transfusion was required in 37% of cases and intraoperative transfusion has been only 17%.

Conclusion: The average drop of haemoglobin postoperatively has been 2gm/dl but a minority of the patients required blood transfusion. The intraoperative blood loss coincides with the drop in haemoglobin and combined with drain fluids equal 250 mls. The use of ICS could be an option to consider and can be used in acetabular fracture surgery however we would require a larger study to determine this.

References: 1. SCANNELL Brian P, LOEFFLER Bryan J., BOSSE Michael J., ELLAM James F., SIMS Stephen H : Efficacy of Intra-

operative Red Blood Cell Salvage and Autotransfusion in the Treatment of Acetabular Fractures. *Journal of orthopaedic trauma* 2009, vol. 23, n°5, pp. 340-345 2. Moreno C, Moore EE, Rosenberger A, Cleveland HC: Hemorrhage associated with major pelvic fracture. *Journal of Trauma* 1986;26:987-989 3. Evers BM, Cryer HM, Miller FB: Pelvic fracture hemorrhage. *Archives of Surgery* 1989;124:422-424

Disclosure: No significant relationships.

EDUCATION

T062 Multicentric Study to Improve the Assistencial Quality in Trauma Patients in Catalunya

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Introduction: The traumatism is the first cause of the mortality in patients under 40. It means a serious incapacity in 1 of 4 trauma patients. The initial management in trauma patients is essential to improve these results

Material and Methods: This is a prospective and multicentric study with the participation of 10 hospitals in Catalunya (Spain). The objectives are to improve the evaluation and the initial management of trauma patients, and to improve the knowledge of the frequency, the magnitude and the approach of these trauma patients. We defined 7 points to improve which are: To intubate patients with Glasgow < 8 (1); To not remove the cervical collar without clinical or radiologic cervical exploration (2); To move trauma patients monitored (3); To not move haemodynamically instable trauma patients (4); To use two thick intravenous cannulations (5); To take thorax and pelvic simple radiographies in the trauma box (6); To fix pelvis fracture with a grassland before moving the patient (7). Between November-2007 – March 2008, 378 trauma patients over 16 have been registered and defined by the ATLS criterions. The results of this initial data records were presented to all participating hospitals at April–September 2008. Afterwards, between October 2008– April 2009, 501 trauma patients have been registered with the same criteria as in the first period.

Results: The 378 patients in the first period have an ISS of 21.21 and the 501 trauma patients in the second period have an ISS of 20.84. Both groups are also homogeneous for the other parameters. The points 1, 2 and 5 did not have significant results because the first registration was excellent: Patients with Glasgow < 8 were intubated in 94.1% of the cases; We did not remove the cervical collar without clinical or radiologic cervical exploration in 83.3% of the patients; and we used two thick intravenous cannulations in 87.3% of the

cases. We moved trauma patients better monitored changing the 78% of the patients in the first period for the 85.2% of the patients in the second period ($p < 0.05$), but it did not mean a change in the percentage of the patients moved in an haemodynamically instability state (from 32.9% in the first period to 26.6% in the second period). We took more thorax and pelvic radiographies in the trauma box (from 45.2% and 27% in the first period to 62.3% and 50.5% in the second period, $p < 0.05$). And we also fixed more pelvis fracture with a grassland before moving the patient, from 24% in the first period to 48.6% in the second period.

Conclusion: The registration of the information about trauma patients allows the identification of the points to improve. We improved the evaluation and the initial management of the trauma patients, especially in the monitorization of trauma patients and in the management of the thoracic and pelvic traumatism

References: Hlaing T. *JTrauma* 61, Dec'06 Cameron A. *JTrauma* 59, Dec'05 Gillott R. *JTrauma* 29, Dec'89

Disclosure: No significant relationships.

T063 Trauma Surgery Education in Spain. Are we Ready?

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Introduction: There is wide evidence about the importance of having good protocols for assisting Trauma Patients and a teaching system for the personnel involved in this assistance is needed. It is also well known that the formation for assisting trauma patients in Spain is not very much spread in general.

Material and Methods: We describe how we have arranged the care for this type of patients in a level II center and a teaching system for our staff and we prospectively analyze the impact of this specific formation by means of a questionnaire and analyzing how correctly the trauma team is activated.

Results: From November 2006 through October 2008 (23 months), 5 editions of our Course have taken place and 54 people have participated (29.5% of the staff for whom the course is aimed to). We found a clear improvement on the results of the test (prior and after the course: 55% of improvement for physicians and 85% for nurses, $p < 0.001$) and the qualification of the final exam was superior. The incidence of rightly activated trauma team improved as the staff was completing the course.

Conclusion: We conclude by enhancing the importance of having adequate protocols for treating these patients and the correct means for teaching the personnel because they can improve the care of these patients.

References: - Carley S. Trauma education. *Resuscitation* 2001; 48: 47-46. - Van Olden G et al 2004; Clinical impact of advanced Trauma Life Support. *Am J Emerg Med* 2004; 22: 522-25. - Cales RH. Trauma mortality in orange county: the effect of implementation of a regional trauma system. *Ann Emerg Med* 1984;13(1):1-10. - Ali JA, et al : Trauma outcome improves following the advanced trauma life

support program in a developing country. *J. Trauma* 1993; 34: 890-94. - Simons R, et al. Impact on process of trauma care delivery 1 year after the introduction of a trauma program in a provincial trauma center. *J Trauma-Injury Infect Crit Care* 46(5):811-5. - Carmont MR. The Advanced Trauma Life Support course : a history of its development and review of related literature. *Postgrad Med J* 2005; 81 : 87-91. - Driscoll P. ATLS : past, present and future. *Emer Med J* 2005; 22 : 2-3. - Morales García D, et al. Análisis sobre la formación de residentes en politraumatismos. *Cir Esp* 2008; 84 (5): 267-72. - Petrie D, et al. An evaluation of patients outcomes comparing trauma team activated versus trauma team not activated using TRISS analysis. *J Trauma* 1996. 41(5):870-875. - Khetarpal S, et al. Trauma Faculty and trauma team activation: Impact on Trauma System function and patient outcome. *J Trauma* 1999. 47 (3): 576-581. - Roettger R, et al. The General surgery model : a more appealing and sustainable alternative for the care of trauma patients. *Am Surg* 2005. 71 (8): 633-8. - Richardson JD. Is there an ideal model for training the trauma surgeons of the future? *J Trauma* 2003;54:795-7. - Pryor JP, et al. Integrating emergency general surgery with a trauma service. *J Trauma* 2004; 57: 467-73.

Disclosure: No significant relationships.

T064 Trauma and Emergency Surgery Education and Training in Portugal

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Introduction: The Portuguese Medical Association (Ordem dos Médicos, OM) is the official entity that regulates all the medical and surgical activities in Portugal, being his duty to protect the public interest. In Portugal there are three official ways to differentiate: Specialty (vertical), Subspecialty (vertical) and Competence (transversal). Doctors may access to a subspecialty or a competence as a second step, after a specialty.

Material and Methods: Doctors must be registered with to practise medicine or surgery. OM also sets the standards and outcomes for basic medical education. After graduating from medical school and completing their foundation training, doctors usually complete a third and even a fourth stage of postgraduate training, whose standards are set by the Colleges. These are responsible for promoting the development of postgraduate medical education and training for all, establishing standards and requirements and making sure they are met across the country.

Results: Emergency Medicine exists as a competence since 2002 and goes behind the prehospital acute care. This College strongly supports the development of an autonomous College of Competence on Emergency Surgery (trauma surgery included) and it exists, since 2007, an official national Working Group on Emergency Surgery Education (Grupo de Trabalho para a Formação Específica em Cirurgia de Emergência), with 13 representatives of general surgery (7), neurosurgery (1), orthopaedics (1), thoracic (1), vascular (1), urological (1) and paediatric surgery (1). The general surgeons – all IATSIC members, ATLS and DSTC instructors and representatives of the existing four trauma and emergency surgery societies, Sociedade Portuguesa de Cirurgia, Grupo Trauma Norte, Associação Lusitana de Trauma e Emergência Cirúrgica e Sociedade Portuguesa de Trauma –, also integrate and lead the National Steering Committee for DSTC, after a recently signed memorandum of understanding with IATSIC. The other members are representatives of the other, surgical specialties colleges, relevant in this field.

Conclusion: The main objective of this multidisciplinary working group is the development of an autonomous College of Competence on Emergency Surgery (trauma surgery included), to rule, in a next future, emergency surgery education and training in Portugal and act as national representative near the UEMS and other international institutions.

References: Ordem dos Médicos, Colégio de Competência em Emergência Médica, Grupo de Trabalho para a Formação Específica em Cirurgia de Emergência. Coimbra, 2009

Disclosure: No significant relationships.

T065 TONK Score. An Objective Method of Analysing Medical Notes

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Introduction: Good medical record keeping is essential for medico legal, research and audit purposes. It is the only lasting interpretation of patient-physician interaction. The Royal colleges and the General medical council, UK have published their guidelines for best practice. A need was felt to devise an objective method of analysing the trauma & orthopaedics case note quality, which is why we propose the Trauma & Orthopaedics Notes Keeping (TONK) score. This system is specialty specific and tries to eradicate the weaknesses in a previously published scoring system, which was generic.

Material and Methods: A total score of 100 is assigned to each firm from the beginning and marks are deducted for missed documentation. 2 sets of notes are randomly selected from discharged patients for each firm, one from trauma and one from elective surgery, each having at least 2 entries. Each case note is given 50 marks and the total deduction for both case notes are then subtracted from the total score of 100 to give the resultant score.

The TONK score has four major parts comprising initial clerking, subsequent entries, discharge letter and legibility. An objective system of scoring the legibility of medical notes is part of the TONK score. This scoring system is easily reproducible and it's been validated using the Kappa statistic.

Results: A maximum score of 100 can be achieved with final scores graded as follows: 100 Excellent 90-99 Good 80-89 Satisfactory 70-79 Poor > 70 Unacceptable This system has been in use in our department for assessing medical notes with marked noted improvement and has become a fixed agenda of our audit meetings. This is a quick, easy and reliable tool and to the authors knowledge there is no other published scoring systems for Trauma & Orthopaedics medical notes keeping.

Conclusion: Medical records are an integral part of effective patient care. They are used not only for primary clinical purposes but also for secondary purposes including reporting the activity of hospital services, monitoring performance of hospitals and for research. They remain the most important focus of any patient complaint or litigation. This is why we propose the TONK score as a quick and easy method for assessing medical notes keeping in Trauma & Orthopaedics. This is a reliable method and to the authors knowledge there is no other published scoring systems for Trauma & Orthopaedics medical notes keeping.

References: 1. www.rcplondon.ac.uk 2. www.rcseng.ac.uk. 3. www.gmc-uk.org 4. Crawford JR, Beresford TP, Lafferty KL. The CRABEL score—a method for auditing medical records. *Ann R Coll Surg Engl.* 2001 Jan;83(1):65-8. 5. Dexter SC, DHayashi, Tysome JR. The ANKLe Score: An Audit of Otolaryngology Emergency Clinic Record Keeping. *Ann R Coll Surg Engl.* 2008 April; 90(3): 231–234.

Disclosure: No significant relationships.

T066 Train-The-Teachers for Surgical Skills in Undergraduate Education

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Introduction: Despite the increasing mechanization in medicine, clinical skills must be to the fore of medical occupation and consequently must have a main focus in medical training. Especially in surgery, the mastery of basic clinical skills is of great importance for the young learner as it besides the knowledge of elementary principles substantially contributes to the understanding of the subject, the development on the wards, the operation theatre and the ambulance. In order to assure a standardized training using reliable, effective modern teaching methods, a “Train-the-Teacher”-Course was developed.

Material and Methods: In an 8-hour training, the important teaching modalities and methods for surgical skills as skills lab, simulation, role play, 4-Step approach are presented and trained in small groups with a maximum of 6 participants per group. Furthermore, the training focuses on „Giving adequate Feedback” and examining practical skills. The training is evaluated using a standardised evaluation form. Furthermore, the teachers are evaluated by their students after each of their teaching sessions before and after the training.

Results: A total of 32 surgeons participated in the training program (5 chief physicians, 10 senior physicians). Overall, the training was rated to be very good (54%) or good (46%). In students' evaluation, there was a significant increase in positive ratings for teachers' didactical competencies as well as for their overall training after the participation in the training program.

Conclusion: The teacher's didactical and social competencies have a major impact on students' knowledge and competence acquisition. Hence, the training of the teachers is a crucial part in medical education.

Disclosure: No significant relationships.

T067 Prevention of Sport Injuries in Children and Adolescents: Are Better Motor Skills and Intense Sport Education Convenient Preventive Factors? A Detailed Analysis and Comparison of 1090 Pupils of Two Secondary Schools in Austria

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Introduction: Sports injury risk management and prevention is a very complex challenge that must be addressed¹. One of the basic tasks is to perform epidemiological studies to estimate the risk in different types of sport. Up to now many studies were conducted on injury rates in specific organised sports². Just a few taking into account any physical activity (PA)³. Therefore only for specific sports data about the influence of higher sport skills on injury risk can be found⁴. The goal of our study was to investigate the relevance of motor skills and sport education on injury risk, including the total PA and the occurrence of any injury in any type of sport.

Material and Methods: In two Austrian secondary schools (Gymnasien) fifty-five of 63 classes were asked to fill out a two sided questionnaire regarding PA and sports injuries within the last year. Demographic data and information about the types of sport, the intensity and the occurrence of injuries was collected. 1090 pupils, 469 from a “normal” school (NG) and 621 from a “sports-school” (SG) filled out the questionnaire. In the SG every child has to pass an entrance exam containing basic coordinative and motor tasks as well as complex motion sequences in different types of ballgames. In the educational program of this school a strong emphasis is placed on sports. In the NG just the basic sport lectures are held.

Results: The total physical activity (PA) containing organised, unorganised sports and leisure time activities was significant higher in the sports-school (SG), 9.9 hours per week vs. 7.6 h/w ($p < 0.01$). The most performed types of sport were similar: in the SG soccer ($n = 202$, 43%), riding bike ($n = 197$, 42%) and running ($n = 176$, 38%); in the normal school (NG) riding bike ($n = 260$, 42%), soccer ($n = 191$, 31%), snowboarding ($n = 171$, 28%) and running ($n = 154$, 25%). Proportionally there were more boys than girls in both schools: 64% boys, 36% girls vs 51% boys, 49% girls. Boys (11.3 h/w, 9.5 h/w) were more active than girls (9.1 h/w, 5.5 h/w) in both schools. The rate of injury was statistically significant higher in boys (0.60) than in girls (0.47) ($p < 0.01$). The mean age was higher in the normal school 14.0 vs 13.4 years. The proportion on injured children was at the same highest level (34%) in 10 and 11, 12 and 13, and in 14 and 15-year-olds.

The ratio of injury per pupil is statistically significant higher in the SG (0.62) than in the NG (0.49) ($p < 0.01$). But including the extension of activity the injury risk is a little bit lower in the SG: 1.20 injuries in 1000 hours of PA vs 1.24.

Conclusion: It seems that better motor skills and intense sport education have no effect on the population risk¹. The individual risk has to be investigated more extensively in future studies.

References: 1 Fuller, 2 Spinks, 3 Spinks, 4 Schwebel

Disclosure: No significant relationships.

T068 Development of a National Guideline for Pain Treatment in Trauma Patients in Prehospital EMS and Emergency Departments

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Introduction: Pain is one of the main complaints of trauma patients in emergency medical care (1). In the Netherlands, a third of all prehospital emergency medical systems (EMS) rides concern trauma patients and yearly 860.000 patients are treated in the Accident & Emergency department (ED) due to an injury. Significant deficiencies in pain management in emergency medicine have been identified (2). As a consequence, patients unnecessarily suffer from pain, and also recovery and healing are delayed. Furthermore, chronic pain is reported one year after trauma (3). There is no appropriate systematic approach to acute pain management in the chain of care for trauma patients in prehospital EMS and the ED. Aim: The aim of the research project is the development of a national evidence-based guideline for the management of acute pain in adult trauma patients in prehospital EMS and the ED.

Material and Methods:

The guideline is developed according to the Appraisal of Guidelines Research & Evaluation (AGREE) methodology with methodological support of the Dutch Institute of Healthcare Improvement (CBO, 4).

An implementation and education plan will be included in the development process, based on previous research on barriers and facilitators in pain treatment in trauma patients. Patient participation will be realised by interviews and focus group interviews.

Patients:

Adult trauma patients in prehospital EMS and the ED.

Professionals:

Paramedics, helicopter EMS members, emergency nurses, emergency physicians, (orthopedic) trauma surgeons, and (general practitioners).

Participants: The guideline will be developed by 11 (scientific) professional organizations including the Dutch Trauma Society.

The development process started in March 2009 and the guideline is planned to be completed at the end of August 2010.

Results: The guideline is currently being developed, and recommendations on pain assessment and (non-) pharmacological pain treatment have been formulated.

At the time of presentation at ESTES 2010, all the recommendations will be completed and the first results of the pilot test can be presented to the audience.

Conclusion: As far as we know this will be the first evidence-based guideline on pain treatment in trauma patients in prehospital EMS and the ED.

References: 1. Cordell WH, Keene KK, Giles BK, et al. The high prevalence of pain in emergency medical care. *Am J Emerg Med* 2002;20(3):165-9.

2. Berben SAA, Meijs THJM, van Dongen RTM, et al. Pain prevalence and pain relief in trauma patients in the Accident and Emergency Department. *Injury* 2008;39(5):578-85.

3. Rivara FP, MacKenzie EJ, Jurkovich GJ, et al. Prevalence of pain in patients 1 year after major trauma. *Arch Surg* 2008;143(3):282-7.

4. Dutch Institute for Healthcare Improvement. Evidence-based guideline development. The guide for study group members. 2007.

Disclosure: The research project is partly financed by a grant from the Dutch Ministry of Health, Welfare and Sport (Netherlands Organization for Health Research and Development (ZonMw) in the program 'Emergency Medicine'.

T069 Evolution of Surgical Treatment for Tibial Fracture and its Impact on training. A UK Experience

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Introduction: The surgical management of an extra-articular fracture of the tibia can be done by internal fixation with plate, intramedullary (IM) nailing (2,3,4) or external fixator. The decision of choosing what device to use depends on a variety of factors, such as the fracture pattern, the soft tissue status, the surgeon's preference and availability of equipment. In United Kingdom (UK), the Specialist Registrar trainee are required to perform at least 18 tibial IM nailing over 6 years to fulfil one of the key surgical procedural requirement.(1) Failure to do so would result in delay in completing the training.

Material and Methods: James Cook University Hospital (JCUH) is a level 1 trauma centre in NE of England. We have looked into the surgical treatment of extra-articular fracture from July 2005 to July 2009. This is a retrospective review. Patient list is collected from theatre record and radiographs are assessed for the level of tibial injury. The treatment choice is recorded and analysed. Union rate and follow up length are also noted.

Results: We have about 58 tibial fractures per year including open injury. The recent trend is that 52% has IM nailing, 43% has plating, 5% has external fixation. IM nailing is used in all middle third and half of the distal third portion of tibial fracture. Plating is applied in all proximal and half of the distal third portion of tibial fracture.

Conclusion: Our unit has 9 specialist registrars on the trauma rota. On average, each should just have 3 IM nailing performed per year, making the total of 18 over 6 years. In reality, the random fashion of trauma presentation would mean some trainee missing out with no fault on their part. If a busy unit could only provide enough opportunity for 1 year quota, a smaller quieter district general hospital is

unlikely to do better. Together with the adoption of the 48 hour working rule in UK, this could reduce the training opportunity further. The training issue has to be addressed sooner rather than later.

References: 1. Assessment of performance in orthopaedic training D. Pitts, D. I. Rowley, and J. L. Sher J Bone Joint Surg Br 2005 87-B: 1187-1191. 2. How should open tibia fractures be treated? A retrospective comparative study between intramedullary nailing and biologic plating. Kayali C, AÄYuÄY H, Eren A, Özlük S. Ulus Travma Acil Cerrahi Derg. 2009 May;15(3):243-8. 3. Radiographic and clinical comparisons of distal tibia shaft fractures (4 to 11 cm proximal to the plafond): plating versus intramedullary nailing. Vallier HA, Le TT, Bedi A. J Orthop Trauma. 2008 May-Jun;22(5):307-11. 4. Intramedullary nailing versus percutaneous locked plating of extra-articular proximal tibial fractures: comparison of 56 cases. Lindvall E, Sanders R, Dipasquale T, Herscovici D, Haidukewych G, Sagi C. J Orthop Trauma. 2009 Aug;23(7):485-92.

Disclosure: No significant relationships.

PEDIATRIC TRAUMA

T070 The Conservative Treatment of Upper Cervical Spine Fractures in Children

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Introduction: The treatment of the upper spine fractures without displacement and neurological damage in children and adolescents is generally conservative.

Material and Methods: From the 1st jan 2001 to the 1st jan 2009 9 upper spine fractures were treated. The mean age of patients was 11,5 years(8-17,5). There were 1 patient with occipital condylar fracture, 3 with C1 fractures, 5 with C2. The fractures were caused by a traffic accident in 5 cases, sport accidents in 3 cases, 1 the others. In 4 patients cervical fractures were accompanied by multiple trauma. After accommodation in hospital XR, CT and MRI were used. All the patients were treated conservatively using the cervical spine brace for 85 days(66-125).

Results: None of the patients showed neurological deficit in the end of treatment. CT scan and XR cervical spine in flexion and extension 3 month after the treatment were used. The bone consolidation was obtained in all cases after the 3 month. In 1 patient XR shows the cervical instability C1_2 after C1 fracture needed the surgical procedure.

Conclusion: The conservative treatment of the upper spine fractures without displacement in children is a save method with good results.

References: 1. Vilela MD, Peterson EC. Atlantal fracture with transverse ligament disruption in a child. Case report. J Neurosurg Pediatr. 2009 Sep;4(3):196-8. 2. Klimo P Jr, Ware ML, Gupta N, Brockmeyer D. Cervical spine trauma in the pediatric patient. Neurosurg Clin N Am. 2007 Oct;18(4):599-620.

3. Stulik J, Pesl T, Kryl J, Vysokocil T, Sebesta P, Havranek P. Spinal injuries in children and adolescents. Acta Chir Orthop Traumatol Cech 2006 Oct;73(5):313-20

4. D'Amato C. Pediatric spinal trauma: injuries in very young children. Clin Orthop Related Res 2005 Mar;(432):34-40.

Disclosure: No significant relationships.

T071 The Treatment of the Monteggia Fractures in Children

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Introduction: The treatment of the Monteggia fractures in children is frequently surgical. The operative stabilization of the ulna reduced the risk of redisplacement.

Material and Methods: From the 1st january 2002 to the 1st january 2009 the 31 children with Monteggia fracture were treated. There were 22 boys and 9 girls, the mean age was 15,2 years (5-17,5). 29 fractures demanded surgical procedures with application of a close (12 patients) or (17 patients) open fracture reduction and close reduction of dislocated radial head and fixation the ulna using elastic Metaizeau nail. During the open reduction we applied an incision allowing to remove soft tissues and to set fragments of fractured bone correctly. In 2 patients we performed close reduction of the fracture without the fixation because of a patient's age.

Results: XR 3 month after surgical procedure was done and in all cases we achieved consolidation of the ulnar fracture and good of radial head reduction. Complication after the treatment was the paresis of the median nerve, neurosurgical procedure needed. The nails were removed 6,5 month after procedure(2-11). After obtaining the union of the fracture and rehabilitation of the limb we removed the nails (3-6 month after procedure).

Conclusion: Featured way of the operative treatment doesn't claim wide opening region of the fracture and reduces possibility of complications. Dislocated radial head after close reduction and immobilization period shows full stability.

References: 1. Nakamura K, Hirachi K, Uchiyama S, takahara M, Minami A, Imaeda T, Kato H. Long-term clinical and radiographic outcomes after open reduction for missed Monteggia fracture-dislocations in children. J Bone Joint Surg Am. 2009 Jun;91(6):1394-404.

2. Schmidt CM, Mann D, Schnabel M. Elastic stable intramedullary nailing as alternative therapy for pediatric Monteggia fractures. Unfallchirurg. 2008 May;111(5):350-7.

3. Fernandez FF, Egenolf M, Carsten C, Holtz F, Schneider S, Wentzensen A. Unstable diaphyseal fractures of both bones of the forearm in children: plate fixation versus intramedullary nailing. Injury. 2005 Oct;36(10):1210-6.

4. Hackl W, Gabl M, Gadner K, Zimmermann R, Sailer R. Delayed radial paralysis after Monteggia fracture—a case report, Unfallchirurg. 2002 Jun;105(6):569-71.

5. Wilkins KE. Changes in the management of Monteggia fractures. J Pediatr Orthop. 2002 Jul-Aug;22(4):548-54.

Disclosure: No significant relationships.

T072 Treatment of Displaced Distal Forearm Fractures in Children: Additional K-Wire Fixation or not?

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Introduction: Due to growth and remodelling capacity of pediatric bone, small deviations from anatomical position can be accepted with distal forearm fractures. In the remaining cases, closed reduction and casting has to be applied. After closed reduction, recurrent dislocation occurs in 20 to 34% of the cases, for which secondary surgical interventions might be required. 1.2 Primary additional percutaneous Kirschner wire fixation could possibly reduce the chance of recurrent dislocation of displaced distal forearm fractures in children and thereby minimize the need for secondary interventions.

Material and Methods: A hundred patients (M:V 69:31) with displaced distal radial, ulnar or antebrachial fractures between 2005 and 2007, requiring closed reduction and possible K-wire fixation at our institution, were included in this study. Average age was 9.4 (\pm 3.2) years. Data and X-rays were retrospectively gathered and analyzed. All fractures were scored according to the AO-pediatric classification. 58 patients were treated with solely closed reduction and cast immobilisation and 42 patients were additionally treated with K-wire fixation. SPSS version 15.0 was used for all statistical analysis.

Results: Incidence of recurrent dislocation was significantly higher in patients treated solely with closed reduction (41%) compared to patients treated with additional K-wire fixation (19%) (p 0.018). The proportion of patients requiring a second surgical intervention was also higher in patients treated with closed reduction: 21% versus 5% of patients treated with additional K-wire fixation (p 0.023). Additional K-wire fixation results in a Relative Risk reduction of 54% and 77% for recurrent dislocation and secondary surgical interventions respectively. Complications of K-wire fixation comprised local infection (n = 2) and K-wire migration (n = 2).

Conclusion: Additional K-wire fixation might reduce the incidence of recurrent dislocation and secondary surgical interventions after closed reduction of displaced distal forearm fractures in children. Larger and randomized studies will have to be obtained to confirm the results from our data.

References:

1 Miller et al. Cast Immobilization Versus Percutaneous Pin Fixation of Displaced Distal Radius Fractures in Children. J Pediatr Orthop Volume 25, Number 4, July/August 2005 2. McLauchlan GJ. Management of completely displaced metaphyseal fractures of the distal radius in children. A prospective randomized controlled trial. J Bone Joint Surg [Br]. 2002;84:413-417

Disclosure: No significant relationships.

T073 The Influence of Strain Rate on the Angle of Spiral Fracture in Paediatric Long Bone

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Introduction: Spiral fractures are commonly presented in the paediatric population, yet distinguishing between inflicted and non-inflicted trauma is challenging. Despite the clinical and forensic importance of ascertaining the approximate loading mechanism required to generate certain fractures patterns, there is a lack of biomechanical literature drawing relationships between the force of trauma and the resulting bone injury in children.

Aim - To investigate long bone fracture patterns following the application of a range of rotational loading.

Material and Methods: Twenty four bovine tibias were harvested from 7 day old calves and divided into eight groups. The soft tissues were removed leaving the periosteum intact. The bones were aligned along their long-axis and immovably fixed in potted holdings. Each group of bones was then subjected to torsion at a particular strain rate (0.5, 1, 15, 30, 45, 60, 75 and 90°/s) until failure. The angle of fracture (to the long axis) was then measured and the periosteum disruption qualified, in addition to calculation of the torsional stiffness.

Results: All 24 specimens failed in spiral fracture. It was observed that the spiral fracture angle (to the long axis) was dependant on the strain rate, ranging from 46.3° at the slower strain rates (1°/s) to 31.3° at the fastest strain rate (90°/s). Spiral fracture was consistently centered on the narrowest waist diameter, with comminution and subsequent periosteal disruption in fractures at the highest strain rate. An increase in bone torsional stiffness was also noted up to 45°/s.

Conclusion: This preliminary study suggests that the angle of paediatric long bone spiral fracture may correlate with the causal torsional strain rate. This result has significant clinical and forensic significance, potentially allowing comparison of parent/caretaker accounts with the apparent cause of injury.

Disclosure: No significant relationships.

T074 The Surgical Treatment of Anterior Tibial Spine Fractures in Children

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Introduction: Tibial eminence fractures are well known in children. These fractures have been classified according to Meyers and McKeever into 3 types and Zaricznyi added comminuted fracture as 4 type. The fractures of the anterior tibial spine could be treated using arthroscopy and fixation with screw.

Material and Methods: There were 12 male and 4 female patients with average age 11.2 years (7.5-15) from the 1st jan 2005 to the 1st jan 2009. All patients had open physes. According to the classification of Meyers and McKeever modified by Zaricznyi, there were 13 type III fractures and 3 type IV fractures. Fractures were caused by sport accident in 12 patients and 4 by another. All patients have been treated using an arthroscopic reposition and stable fixation. Postoperatively, the knee was immobilized for 6 weeks(2.5-8), (axial weight bearing allowed

Results: The follow-up was 24 month (9-44).XR was done 1 and 3 month after procedure. The bones consolidation were obtained in all cases 3 month post-op. In 1 case XR1 month post-op. shows the displacement of the tibial spine with anterior instability needed the ACL plasty. The others patients didn't present the knee's instability in orthopedic exam 6 month after procedure and during the pivot sports. The mean score on the International Knee Documentation Committee (IKDC) was 94(88-98).

Conclusion: The surgical treatment of the anterior tibial spine in children prevent the knee's instability. and the arthroscopic reposition and stable fixation of anterior tibial spine fracture in children is good and safe procedure.

References: 1.Osti L, Merlo F, Liu S, Bocchi L. A Simple Modified Arthroscopic Procedure for Fixation of Displaced Tibial Eminence Fractures. *Arthroscopy* 2000;16:379-82.
2.Van Loon T, Martri RK. A Fracture of the Intercondylar Eminence of the Tibia Treated by Arthroscopic Fixation. *Arthroscopy* 1991;7:385-8.
3.Sharma A, Lakshmanan P, Peehal J, David H. An analysis of different types of surgical fixation for avulsion fractures of the anterior tibial spine. *Acta Orthop. Belg.* 2008;74:90-7.
4.Lehman RA, Murphy KP, Machen S, Kuklo TR. Modified Arthroscopic Suture Fixation of a Displaced Tibial Eminence Fracture. *Arthroscopy* 2003;19:E6.
5.Wiley JJ, Baxter MP. Tibial Spine Fractures in Children. *Clin Orthop Rel Res* 1990;255:54-60.
6.Baxter MP, Wiley JJ. Fractures of the Tibial Spine in Children. *J Bone Joint Surg (Br)* 1988;70-B:228-30.
7.Kawate K, Fujisawa Y, Yajima H, Sugimoto K, Habata T, Takakura Y. Seventeen-Year Follow-up of a Reattachment of a Non-united Anterior Tibial Spine Avulsion Fracture. *Arthroscopy* 2005;21:760e1-e5.
8.Vega JR, Iribarra LA, Baar AK, Iniguez M, Salgado M, Gana N. Arthroscopic Fixation of Displaced Tibial Eminence Fractures: A New Growth Plate-Sparing Method. *Arthroscopy* 2008;24:1239-43.
Disclosure: No significant relationships.

T075 Tricalcium Phosphate in the Treatment of Juvenile Bone Cysts in Children

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Introduction: Juvenile bone cysts in children and adolescents are often discovered incidentally or in connection with a pathologic fracture. Although the diagnostic procedure in this type of lesion affecting the skeleton has become uniform, the treatment varies according to the principles established at different clinics. The aim of our study was to compare two methods applied in the treatment of juvenile bone cysts, i.e. the established method of a series of Methylprednisolone injections and a new mini-invasive method using a Tricalcium phosphate.

Material and Methods: In both groups of patients, we performed an evaluation of the number of required surgeries, general anaesthetics and subsequent hospitalizations (including the length of hospitalization), the treatment results and the interval between surgery and complete cyst healing using Neer's evaluation criteria. The group of patients treated with Methylprednisolone consisted of 24 patients and the group of patients treated with Tricalcium phosphate comprised 20 patients.

Results: The outcome of the statistical analysis proves that in patients treated with Tricalcium phosphate significantly better results were obtained compared to patients where Methylprednisolone was applied. A subsequent surgery (additional application) was necessary only in two Tricalcium phosphate patients (10%) compared to

nineteen Methylprednisolone patients (79%). The average length of hospitalization was 4 days in Tricalcium phosphate patients and 3.5 days in Methylprednisolone patients. Excellent and good results according to the Neer classification were documented in eighteen Tricalcium phosphate patients (19%) and in twelve Methylprednisolone patients (50%).

Conclusion: The treatment of juvenile bone cysts with a biocompatible resorbable synthetic filler Tricalcium phosphate helps reduce the number of surgeries necessary for complete cyst healing and produces better results in terms of Neer's evaluation criteria of bone cyst treatment results compared to the application of Methylprednisolone into the cyst.

References: This work was supported by the Internal Grant Agency of the Ministry of Health of the Czech Republic (NS9860-3/2008).

Disclosure: No significant relationships.

T076 Does Gravitational Platelet System (GPS) Fasten Healing of Juvenile Bone Cysts?

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Introduction: The different treatment strategies of bone cysts in children are associated with persistence and high recurrence rates. We studied for the first time the combination of ESIN, Orthoss[®] and autologous platelet rich plasma (GPS[®]).

Material and Methods: Since 2007 we offered all children with bone cysts, either in the case of a pathologic fracture, failure of earlier treatment or in a prophylactic manner the treatment combination of ESIN, artificial bone substitute and autologous platelet rich plasma (Gravitational Platelet Separation = GPS[®]). Radiographic controls were planned after one and six month and until the removal of the intramedullary nailing. We documented all peri- and postoperative morbidity, further operative procedures, the radiographic findings as classified by Capanna and the time till removal of the Nails.

Results: A cohort of 10 children (four girls, six boys) was recruited. Mean patient age was 12,4 years (9-15 y). The bone defects included eight juvenile and two aneurysmatic bone cysts. Four patient suffered earlier unsuccessful treatment after pathologic fracture. The other six presented with acute pathologic fractures (five humeral, one femoral). No postoperative complications occurred after the treatment combination of elastic intramedullary nailing, curettage, artificial bone substitute and autologous platelet rich plasma (GPS[®]-System). The radiographic findings showed at six month a total resolution of the cysts in eight cases (Capanna Typ I), in two cases a tiny residual cyst remained (Capanna Typ II). The removal of the Nails was possible after six to nine month. One fourteen year old boy (Typ II Capanna) wished a further GPS application to reach a total resolution. All patients showed very good functional results and no refracture occurred.

Conclusion: The GPS[®]-System enhances the treatment of bone cysts in children. It is a save method without additional perioperative complications. By this, total treatment time can be shortened and secondary procedures as difficult changes of the elastic nails will be lessened. Technically the decisive factor is the debridement of the

cyst with the filling up of the entire cyst with artificial bone substitute and autologous platelet rich plasma.

Disclosure: No significant relationships.

HIP

T077 Preoperative Cardiac Evaluation of Patients with Acute Hip Fracture

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Introduction: The purpose of this study was to investigate the use of the American College of Cardiology (ACC) and the American Heart Association (AHA) guidelines for perioperative assessment of orthopaedic patients with acute hip fracture.

Material and Methods: In a retrospective study 304 patients with an acute hip fracture were included. All patients were treated in the university hospital of Maastricht in the Netherlands between 2003 and 2006. We analyzed the preoperative cardiac screening with respect to content and following ACC/AHA guidelines. Secondary outcome measurements were in-hospital, 30-day and 1-year mortality and delay to surgery in relation with unnecessary preoperative testing.

Results: In hospital death occurred in 5% (15/304) of patients. 1-month mortality was 8% (23/304) and 1 year mortality 25% (77/304). The mortality rates increased with the cardiac risk. 87% (156/180) of low risk patients received a correct preoperative cardiac evaluation according to the ACC/AHA guidelines. In the intermediate risk group this was 55% (41/74) and in the high risk patients this was 86% (43/50). Respectively 12%, 42% and 10% of patients underwent an unnecessary preoperative cardiac screening (over screening). This was the most important reason for incorrect following of the ACC/AHA guidelines, this led to an unnecessary treatment in 3% (8/304) of patients (over treatment). Only 1% (4/304) did not receive a necessary screening (under screening) and 23% (69/304) did not receive the right treatment (under treatment). The main reason for this was the not receiving the recommended β -blocker. In 7 out of the 23 patients (30%) operated after 48 hour, delay to surgery can be explained by unnecessary cardiac evaluation.

Conclusion: In 19% of our patients with an acute hip fracture preoperative cardiac screening was not necessary according to the ACC/AHA guidelines. 23% of patients did not receive the recommended preoperative treatment, mostly due to the lack of prescribing β -blockers. Implementation of the guidelines in our hospital would reduce unnecessary preoperative screening and hence preoperative resources.

References: Fleisher, L.A., et al., ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery): developed in collaboration with the American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society of

Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, and Society for Vascular Surgery. *Circulation*, 2007. 116(17): p. e418-99

Disclosure: No significant relationships.

T078 Management of Fracture Neck of Femur in Medically Unfit ASA4 Patients Using Direct Infiltration Local Anesthesia Rather Than Regional Blockade

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Introduction: Patients presenting with fracture of the femoral neck are usually elderly, and often have extensive co-morbidity. Patients who are considered too unwell for surgery are often kept being delayed until assumed optimized or treated non-operatively. These patients have a high morbidity and mortality and present significant nursing difficulties.

Material and Methods: We describe a technique of fixation of fracture of the femoral neck under direct infiltration local anaesthesia; that can be performed on the sick elderly patient without the risks associated with general or regional anaesthesia. In a series of twenty eight patients all diagnosed with serious co-morbidity (ASA4) on pre-operative assessment. Twenty three patients suffered from extracapsular fracture neck of femur and five intracapsular fracture neck of femur. All patients were informed about the risks of anaesthesia by the senior anesthetist prior to surgery. A mixture of 20 mls n.saline + 20mls of 1% lignocaine with 1:200,000 adrenaline + 20mls of 0.25% plain marcaine (total 60 mls used). This can be increased up to 140 mls in the same ratios.

Results: All patients were operated by various grade registrars. Twenty four (24) DHS and four Hemiarthroplasty were performed. The patients were all able to complete the surgery using this technique; none required conversion to another form of anaesthesia. The average duration of surgery was 44 min. All patients survived the procedure and until discharge from hospital.

Conclusion: Finlayson and Underhill (1988) suggested that extracapsular fractures are supplied predominantly by the femoral nerve and are therefore more amenable to this type of treatment. We recommend the consideration of this technique for management of patients with severe co-morbidity and fracture of the femoral neck in order to optimise their chance of survival and avoid the morbidity associated with bed rest and delayed surgery.

References: 1. Bentley G. Treatment of nondisplaced fractures of the femoral neck. *Clin Orth Rel Res* 1980;152:93–101. 2. Berggen D, Gustafson Y, Eriksson B, et al. Postoperative confusion after anaesthesia in elderly patients with femoral neck fractures. *Anaesth Analg* 1987;66:497–504. 3. Bigler D, Adelhof B, Petring OU, et al. Mental function and morbidity after acute hip fracture surgery during spinal and general anaesthesia. *Anaesthesia* 1985;40: 672–6. 4. Critchley LAH. Hypotension, subarachnoid block and the elderly patient. *Anaesthesia* 1996;51:1139–43. 5. Critchley LAH, Stuart JC, Short TG, Gin T. Haemodynamic effects of subarachnoid block in

elderly patients. *Br J Anaesthesia* 1994;73:464–70. 6. Haddad FS, Williams RL. Femoral nerve block in extracapsular femoral neck fractures. *JBJS Br* 1995;77(6):922–3.

Disclosure: No significant relationships.

T079 Hip Fracture Antibiotic Prophylaxis: 3 Dose Cefuroxime Regime Versus Single Dose Gentamicin and Amoxicillin

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Introduction: Antibiotic prophylaxis aims to reduce wound and prosthetic infection, with minimal adverse effects. The 3 dose Cefuroxime regime is widely used, despite the risk of infective diarrhoea. We describe the results of single dose intraoperative Gentamicin and Amoxicillin compared to this standard regime.

Material and Methods: We retrospectively reviewed 220 patients following hip hemiarthroplasty, creating 2 demographically matched cohorts; Group 1 had received 3 doses of Cefuroxime (n = 113) and Group 2 had received single dose Gentamicin and Amoxicillin (n = 107). End points were evidence of infection, length of stay and Clostridium difficile (CD) rates.

Results: Results showed a significant reduction in group 2 for the average length of stay (17 Vs. 13 days p = 0.0432) and CD rates (7/113 Vs 0/107 p = 0.0158). Considering antibiotic therapies administered; significant reductions in group 2 were seen in the number of patients that required post-operative antibiotics (99/113 Vs 73/107 p = 0.0005), the median antibiotic DDDs (Defined Daily Doses) in 1st 2 post-operative days (0.25 Vs 0 p = 0.0000) and those that received Ciprofloxacin or Cefuroxime post-operatively (82/113 Vs 24/107 p = 0.0000). No significant difference was found with regards to median antibiotic DDDs, median antibiotic DDDs from 2nd post-operative day, patients that received Flucloxacillin post-operatively. Measured microbiological outcomes showed a significant reduction in the number of patients with confirmed growth requiring treatment with antibiotics in group 2 (21/23 Vs 12/22 p = 0.0053). No difference was found between number patients with operation site swabbed and those with confirmed microbial growth.

Conclusion: We demonstrate that single dose Gentamicin and Amoxicillin significantly reduces length of stay, CD rates and the number of patients requiring post-operative antibiotics for wound infection, inferring a reduction in the rate of wound infection. We would recommend this as an effective alternative to the 3 dose Cefuroxime regime.

Disclosure: No significant relationships.

T080 To What Extent are Pre-Operative Albumin Levels Associated With In-Patient Recovery After Hip Fracture Surgery?

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Introduction: Serum albumin level is a reliable tool for screening nutritional status and as a prognostic indicator. Studies measuring the association of pre-operative albumin and surgical outcome after hip fractures have focussed on outcome themes such as length of stay, mortality rate, hospital costs, functional recovery and discharge status. We report a study encompassing a combination of clinically related outcome measures that more closely reflect the inpatient's recovery. The aim of our study was to determine to what extent pre-operative albumin levels are associated with inpatient post-operative recovery in the elderly admitted with a hip fracture.

Material and Methods: A retrospective case note review was performed on 46 patients aged 65 years or older admitted to hospital with a fractured neck of femur. Serum pre-operative albumin levels was measured with factors that determine inpatient recovery after hip fracture surgery such as wound infection, wound healing, frequency of post-operative complications and length of stay (LOS).

Results: Based on an albumin level of ≤ 34 g/l, twenty two patients (47.8 %) were found to be malnourished on hospital admission. Mean LOS was significantly longer in patients with an albumin level of ≤ 34 g/l than in those with levels > 34 g/l (29 days versus 17.6 days, p = 0.035). A total of 16 patients had zero number of post-operative complications with a mean albumin (\pm SD) of 37.56 ± 5.28 g/l, 12 with one complication (35.67 ± 3.63 g/l), 12 with two complications (30.92 ± 5.38 g/l) and 6 with three complications (30.67 ± 2.66 g/l). Albumin values were significantly lower in patients with two or three complications than those with zero complications (zero and two complications p = 0.001, zero and three complications p = 0.004). No significant difference in levels was found between one and zero complication (p = 2.94). Admission albumin was not significantly lower in patients with wound infection than those without (30.20 ± 2.58 g/l versus 34.95 ± 5.47 g/l, p = 0.064). Patients with a dry and intact wound had a higher mean albumin value than those with wound healing complications (mean albumin 38 ± 4.24 g/l versus 31 ± 4.23 g/l, p = 0.0001).

Conclusion: Our study findings support the hypothesis that lower pre-operative albumin levels are associated with a more adverse inpatient post-operative recovery. These patients can be identified and optimised early in preparation for adverse events likely to occur in the post-operative period.

References: Bernhardt NE, Kasko AM (eds). Nutrition for the middle Aged and Elderly. New York: Nova Biomedical Books; 2008. Koval KJ, Maurer SG, Su ET, Aharonoff GB, Zuckerman JD. The effects of nutritional status on outcome after hip fracture. *J Orthop Trauma*. 1999; 13 (3): 164–169.

Disclosure: No significant relationships.

T081 Targon FN: Clinical Results With a New System to Treat Femoral Head Fractures

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Introduction: The Targon hip screw was developed with the goal to fix femoral neck fractures. With the increase of femoral neck incidence, this implant allows a good fixation and early weight bearing in elder patients with osteoporotic bone. The biomechanical features of the implant leads to be a good alternative to hip prosthesis with an economical relevance

Material and Methods: The Targon FN is a new kind of side plate with six locking screw ports. The two distal holes are used to fix the plate to the lateral cortex of the femur with angle stable 4.5 mm cortical screws. The proximal holes allow the implementation of up to four "TeleScrews" which cross the fracture site. These 6.5 mm screws are dynamic and allow therewith the collapse of the fracture at the femoral neck. We present a prospective study on 30 patients with a comparative 30 patients case control with a total hip cementless arthroplasty for the same indication at the same period.

Results: This new device show a lower incidence of complications on the first 3 weeks than with the total hip group. Whereas the 3 month control show no difference between the two groups. There are an X rays neck collapse one year follow up in osteoporotic patients with Singh 1 an 2 stade with no significant consequences on the functional score.

Conclusion: Targon FN is a good alternative for older and multimorbid patients with less surgical burden and reduced early access morbidity in comparison to the prosthesis group.

References: DKOU Lunch Symposium, Berlin October 23, 2008, Martyn Parker, MD PD Dr. H.-W. Stedtfeld New methods in the treatment of proximal femoral fractures - Targon® FN and Targon® PFT - First clinical experiences with Targon - Targon® FN, the head preserving solution for femoral neck fractures® PFT - next generation of a biaxial locking nail system

Disclosure: No significant relationships.

T082 The Results of Hip Surgery Raised as a New Performance Indicator

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Introduction: With 15.000 hipfractures a year, hipsurgery frames a significant part of the dutch daily surgical practice. Nowadays, the percentage of fractures operated within 24 hours is a valid performance indicator. Without wanting to devalue the importance of timing of surgery, the ultimate results appear evenly significant in this vulnerable group of patients. To sample the quality of our personal interventions, a retrospective study with regard to number of re-interventions and survival within 1 year was performed.

Material and Methods: All operated hipfractures from January 2003-2007 were included. This group was split up into 5 subgroups, depending on choice of implant: hemi hip prosthesis (HHP), cannulated hip screws (CHS), dynamic hip screw (DHS), gamma-nail (GN) and proximal femur nail (PFN). The number of re-interventions in theater was counted, varying from purging a hematoma to remove or replace a previous implant. In addition, the number of deaths within one year after the initial surgery was numbered.

Results: Altogether, 952 hipsurgeries were performed. Respectively 312 Hemi Hip Prosthesis, 99 Cannulated Hip Screws, 224 Dynamic Hip Screws, 158 Gamma Nails and 159 Proximal Femur Nails were implanted. The total number of re-interventions amounted 77 (8%) and in the subgroups consecutively: 9(3%), 24(24%), 18(8%), 10(6%) and 16(10%) within one year. The one-year-mortality overall was 21%(202 patients) and in the subgroups consecutively: 21%(65), 6%(6), 19%(43), 30%(48) and 25%(40).

Conclusion: The number of re-interventions and the mortality within one year after hip fracture surgery is sizable. Nonetheless, our numbers are not unfavourable in comparison with international literature. The percentage of re-interventions in the cannulated hip screw group is significantly higher than in the other subgroups. On the contrary, the mortality in this group is low. This is undoubtedly an expression of our attempts to preserve the femoral head in vital, active patients. Possibly, the combination of the two standards - namely the re-intervention and mortality- is a new accurate performance indicator.

References: Introduction:

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Disclosure: No significant relationships.

T083 Managing Periprosthetic Fractures of the Proximal Femur: The Next Challenge in Trauma Surgery

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Introduction: Introduction: Continuously increasing life expectancy and rising number of prosthetic joint replacements are responsible for the fast growing number of periprosthetic fractures of the femur. Those fractures often occur in elderly patients with medical comorbidities. Only few studies have documented its associated morbidity and mortality. We analysed those parameters in our own small cohort of patients.

Material and Methods: Methods: During the time period 2003 to October 2008 all data from patients treated for periprosthetic fractures of the femur were included into this single institution case series. We focused on the patients who underwent ORIF using locking plate technology (LCP, Synthes®). Data on periprosthetic fracture pattern, surgical procedure, type of arthroplasty, length of hospital stay and morbidity and demographics were collected. Mobility before and after hospital admission was asked during follow up examinations.

Results: Results: Of all patients who sustained a periprosthetic femoral fracture during this time period (n = 42) we identified 19 (45.2%) who had been treated with open reduction and internal fixation by using tension bandage and LCP only. Those patients suffered from a fracture after hip hemi- or total arthroplasty. By using the Vancouver classification system 9 fractures were classified type B1, 4 were classified type B2, one type B3 and 5 type C were documented. The majority of patients (15, 79%) fell in their own environment. Age at the time of fracture was 83.1 years (59-95), 16 (84%) of the patients were female. No intraoperative complications occurred. Few postoperative complications needed treatment. 3 haematomas required surgical evacuation. In follow up we documented 3 implant failures due to a fracture of the implant. Two patients (10.5%) had deceased 12 and 24 months after operation unrelated to the operation.

Conclusion: Conclusion: Despite the relative small case load, this quality control survey concludes the largest analysed group of periprosthetic proximal femoral fractures in Switzerland, as far as we are

informed. The operative treatment with LCP and tension bandages shows small morbidity regardless the comorbidities and the geriatric cohort. It remains standard procedure for periprosthetic fractures of the femur at our institution. We are expecting the number of periprosthetic fractures to be increasing rapidly.

References: Treatment of periprosthetic femur fractures with the non-contact bridging plate: a new angular stable implant J. B. Erhardt Â· K. Grob Â· G. Roderer Â· A. HoVmann Â· T. N. Forster Â· M. S. Kuster Arch Orthop Trauma Surg (2008) 128:409â€”416 Aspects of current management The Management of periprosthetic fractures around the femoral stem I. D. Learmonth J Bone Joint Surg [Br] 2004;86-B:13-9. Mortality After Periprosthetic Fracture of the Femur Timothy Bhattacharyya, Denis Chang, James B. Meigs, Daniel M. Estok, II and Henrik Malchau J Bone Joint Surg Am. 2007;89:2658-2662

Disclosure: No significant relationships.

T084 Clinical Long-Term Follow-Up Study for Periprosthetic Femoral Fractures

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Introduction: Periprosthetic femoral fractures are rare but severe complications following total hip- or knee-arthroplasty.

The incidence for of these fractures are increasing, caused by a raising frequency of total arthroplasty for both younger and elderly patients as well as by a higher life expectation.

So far there are very little long-term results regarding this issue.

Material and Methods: 25 patients (15 female, 10 male) with a mean age of 76 years (56-92) were clinically and radiologically examined on average 30 months after surgery.

We investigated the prosthesis (total hip arthroplasty vs. total knee arthroplasty) and compared the treatment (revision arthroplasty vs. osteosynthesis) in this study.

For the clinical examination we used the Harris-Hip-Score (HHS), Oxford-Hip-Score (OHS), the Oxford-Knee-Score (OKS), the SF-36 and the Funktionsfragebogen Hannover (FFH) which measured the functionality of patients in his daily routine in his environment.

Results: THA + osteosynthesis (n = 8)

25% of the patients had fair or better results with an average HHS of 61. 38% of this group had a good or excellent result with an average OHS of 33 and 12% had a FFH score of $\geq 50\%$. 50% of the patients had a possible hip flexion of $\geq 100^\circ$ and (66% $\geq 90^\circ$). The average SF-36 score for this group was 28.

THA + revision arthroplasty (n = 12)

50% of the patients had fair or better results an average HHS of 70. 58% of this group had a good or excellent result with an average OHS of 29 and 45% a mean FFH score of $\geq 50\%$. 75% had a possible hip flexion of $\geq 100^\circ$ (100% $\geq 90^\circ$). The average SF-36 score for this group was 34.

TKA + osteosynthesis (n = 5)

20% of the patients had a good or excellent result with an average OKS of 31 (SD 4,8) and 40% with FFH score of $\geq 50\%$. 80% had a

possible knee flexion of $\geq 100^\circ$ (100% $\geq 90^\circ$). The average SF-36 score for this group was 32.

For the THA patients we found 10 Type B1, 8 Type B2 and 2 Type C fractures (Vancouver Classification)

All 6 TKA patients had Type II fractures (Classification of Lewis and Rorabeck)

In all B1 fractures (stable prosthesis) the osteosynthesis were compared with revision arthroplasty:

- Osteosynthesis: average HHS of 60 with 33% fair or better results; average OHS of 33 with 33% good results
- Revision: average HHS of 72 with 75% fair or better results; average OHS of 26 with 50% excellent results

Conclusion: The results of the scores are mainly caused by the high age, the common multimorbidity and the low overall functionality of the patients and confirm the severity and importance of these kinds of fractures.

Most authors suggest a treatment of these fractures according to the classification by using osteosynthesis to treat stable fractures and revision for unstable fractures. However we see a slightly better outcome of the revision arthroplasty compared to the patients that were treated with osteosynthesis. We suggest more studies with a higher number of patients regarding this issue.

Disclosure: No significant relationships.

SHOULDER

T085 Is the Fracture–Dislocation of the Proximal Humerus a Real Emergency? Comparison of the Results of Immediate and Delayed Surgery

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Introduction: Fracture dislocation of the proximal humerus is a rare but challenging situation for the orthopaedic surgeon. If a closed attempt to reduce the dislocation fails, a demanding surgical procedure is required and the emergency setting is not always the best situation to face difficult cases. As a matter of fact a proper approach to this fractures involve an experienced surgeon, more than one assistant and a variety of instrumentation that often lack in emergency. Fracture dislocation of the humeral head is related with a significant increase of the risk of the humeral head necrosis and it is widely accepted that these lesions are best treated in emergency, but there are no reports on the influence of the dislocation time on the results of the surgical procedure. With this study we wanted to determine if a delayed procedure could affect the outcome of these lesions and if there is a rationale in postponing the procedure to allow a better organisation of the surgical time.

Material and Methods: We retrospectively analysed the clinical and radiological records of 22 patients admitted at our institute for FDHH between Jan 2005 and Jan 2008. Ten out of them were operated in emergency while 12 with a minimum delay of 24 hours. All the patients underwent open reduction and fracture fixation with locking plates.

Results: The results of the two groups were similar and influenced mainly by the bone quality and age of the patient. It seems that a delay in the procedure does not alter the result in terms of rate of necrosis of the humeral head or influence a worse clinical outcome.

Conclusion: On the basis of these results we do not consider these fractures as emergencies anymore: our preference is still an immediate operation provided the presence of an experienced surgeon, assistant and nurse and the availability of the proper instrumentation, conversely we believe that the risks of an immediate procedure overwhelm its benefits.

Disclosure: No significant relationships.

T086 Minimal Invasive Long PHILOS® Plate Osteosynthesis in Metadiaphyseal Fractures of the Proximal Humerus

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Introduction: Minimal invasive plate osteosynthesis (MIPO) should belong nowadays to the armamentarium of each trauma surgeon. Applied correctly, MIPO not only meets the criteria of a “biological” osteosynthesis by minimizing invasivity as well as iatrogenic soft tissue damage caused by the operation, but can also provide adequate reduction and stability for fracture healing and early functional aftertreatment. Up to date, only few publications report on MIPO of humeral shaft fractures mainly using the antero-lateral deltopectoral approach for plate insertion¹⁻³.

Material and Methods: In this present study, we evaluated 29 patients (mean age 77 years, range 48-95) with displaced metadiaphyseal fractures of the proximal humerus treated in MIPO technique using an angular stable long PHILOS®-plate. A lateral deltoid-split approach was used proximally and a brachialis/ brachioradialis intermuscular approach with exposure of the radial nerve was used distally. There were 23 acute fractures including two periprosthetic as well as one pathological fracture. Three patients were operated after failed conservative treatment, one for delayed-union and two cases were revision surgeries.

Results: There were no infections and no iatrogenic injuries to the axillary and radial nerve, respectively. All the 29 patients were immediately allowed active shoulder and elbow movement. One patient had to be reoperated ten weeks postoperatively for redislocation of the distal fragment with screw breakage, which was most likely due to incorrect screw placement. This patient was successfully operated using the same method and implant. Whereas one patient refused follow-up, 28 patients showed entirely healed fractures and satisfactory shoulder and elbow function after a mean follow-up of 8 months (range 3 - 12 months).

Conclusion: Minimal invasive long PHILOS®-plate osteosynthesis using a combined lateral deltoid-split and brachialis/brachioradialis intermuscular approach proved to be a safe and viable procedure for

the treatment of metadiaphyseal fractures of the proximal humerus with low morbidity and good functional outcome.

References: 1. Apivatthakakul T, Arpornchayanon O, Bavornratavech S. Minimally invasive plate osteosynthesis (MIPO) of the humeral shaft fracture. Is it possible? A cadaveric study and preliminary report. *Injury* 2005; 36:530-8. 2. Livani B, Belangero WD. Bridging plate osteosynthesis of humeral shaft fractures. *Injury* 2004; 35:587-95. 3. Lau TW, Leung F, Chan CF, Chow SP. Minimally invasive plate osteosynthesis in the treatment of proximal humeral fracture. *Int Orthop* 2007; 31:657-64.

Disclosure: No significant relationships.

T087 Navigated Osteosynthesis of the Proximal Humerus with PHILOS Plate

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Introduction: Plating for reduction and stabilization of proximal humerus fractures is a common orthopaedic procedure. However, angular and rotational malalignment is not an infrequent result, and extensive use of fluoroscopy is commonly involved. We checked the accuracy of a computerized navigation system (Vector vision trauma navigation system, Brain LAB) to enhance multiplanar fracture reduction and to decrease the requirement for fluoroscopy.

Material and Methods: 5 men and 7 women aged 36 to 78 (mean, 56) years underwent PHILOS plate fixation for proximal humeral fractures. All fractures were closed with no associated injuries and classified as 11-A3 (n = 7), 11-B1 (n = 4), and 11-B2 (n = 1), according to the AO classification. The cases were assessed operation time, radiation time. And accuracy measurements were taken.

Results: Patients were followed up for 6 to 37 (mean, 16) months. All the fractures united and occurred no avascular necrosis. The mean operation time and radiation time were 74 minutes (range, 56-91) and 3.2 minutes (range, 1-7). The mean distance between fluoroscopy and navigation of reduction accuracy at the fracture site were 1.5 mm (range, 0-5).

Conclusion: The fluoroscopic operation using PHILOS plate was troublesome, but navigated operation was easy to reduce the fracture because of the 2 direction visualization at the same time. And computerized navigation has the potential for increasing precision in fracture reduction while minimizing fluoroscopic requirements at proximal humerus fractures.

References: 1. Weil YA, Liebergall M, Mosheiff R, Helfet DL, Pearle AD. Long bone fracture reduction using a fluoroscopy-based navigation system: a feasibility and accuracy study. *Computer Aided Surgery*. 12(5):295-302, 2007. 2. Grutzner, Paul Alfred. Langlotz, Frank. Zheng, Guoyan. et al. Computer-assisted LISS plate osteosynthesis of proximal tibia fractures: feasibility study and first clinical results. *Computer Aided Surgery*. 10(3):141-9, 2005. 3. Schmucki D, Gebhard F, Grutzner PA, et al. Computer aided reduction and imaging. *Injury*. 35 Suppl 1:S-A96-104, 2004.

Disclosure: No significant relationships.

T088 Treatment of the Proximal Humeral Fracture with Trigen Nail

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Introduction: Third proximal humeral fractures are approximately about 5% of adults and elderly patients fractures, in which osteoporosis makes internal fixation problematic and frequently contributes to failed fixation and poor clinical results. Surgical management remains controversial, and there are different options for treatment, such as immobilization, minimal invasive surgeries, nails or anatomic plates.

Material and Methods: We present a clinical and radiographic retrospective study of 47 fractures in 44 patients with third proximal humeral fracture treated with Trigen antegrade nail. There were 29 two part fractures (61.70%), 13 three parts fractures (27.65%) and 5 with shaft extension (10.64%). The mean age of patients was 64 years old (22-87). There were 73.3% females, and no difference between right or left arm, with three cases with bilateral fracture.

Results: 42 patients showed excellent functional outcomes (good function to do their own personal activities and to start them early). All fractures except one healed in a mean period of 2,6 months. There was one pseudoarthrosis that needed a new intervention, one extraction because of discomfort and two screw extractions because of migration. No infection or avascular necrosis was found during follow up. The mean Constant score with the adjustment of age and gender didn't differ from results of other series.

Conclusion: The correct reduction and nail technique lets patients start an early rehabilitation. This technique can make the patient have a quicker recuperation and enables them to do their own personal activities earlier.

References: - Misra. Complex Proximal humeral fractures in adults a- a systematic review of management. *Injury* 32: 363-372 - Van der Brock. Displaced proximal humeral fractures: intramedullary nailing versus conservative treatment. *Arch Orthop Trauma Surgery* 2007, 127: 459-463. - Calvo E. Percutaneous fixation of displaced proximal humeral fractures: Indications based on correlation between clinical and radiographic results. *Journal of Shoulder and elbow surgery* 2007. - Karol Zyto et al. Treatment of displaced proximal humeral fractures in elderly patients. - Naeder Helmy et al. New trends in treatment of proximal humerus fractures. *CORR* 442; 100-108, 2006. - Sosef N, et al. The polaris intramedullary nail for proximal humeral fractures: outcome in 28 patients followed for 1 year. *Acta Orthop.* 2007; 78(3): 436-41.

Disclosure: No significant relationships.

T089 The RETRON-Humerus-Shortnail. An Alternative in Proximal Humerus Fractures

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Introduction: The proximal humerus fracture is a frequent fracture in the elderly people. The lower density of the bone with increasing age

is one of the main reasons for implant failure after osteosynthesis with a range of 10-50 %. The options of therapy are including the screw-, platelet- or nail-osteosynthesis or the endoprosthesis. Belonging to failure rates and the demand for early activity there is a tendency to be seen for early and strong stabilisation.

Material and Methods: Since August 2006 114 proximal humerus fractures were operated with the RETRON-Humerus-Shortnail. The average of age was 73,6 +- 15,4 (28-96) years. The demographic data, bone quality and fracture classification were documented including procedure of reposition, details of the implants, complications and postoperative course.

Results: There were 8,3% A3 fractures, 52,1% C1, 27,1% C2 and 8,3% C3 fractures (AO-Classification). The reposition was done in a closed manner with a direct percutaneous assistance respectively. Intraoperatively 2 secondary dislocations and 1 corticallis brake was to be seen. There have been 2 insufficient nailing procedures. 6 screws had to be exchanged. The gymnastic began immediately after operation or with a delay of 1-2 weeks depending on the fracture classification. The evaluation of the Constant Score is on the way. The results show a good stability of the nail especially in osteoporosis. Comparing with platelets or antegrade nailing it is a minimal invasive procedure. The extraarticular access avoids any damage to the shoulder structures, especially to the rotator muscles. Therefore early gymnastic of the shoulder is possible. Shoulder impingement, screw dislocation and problems with the shoulder are avoided principally. The learning curve is short.

Conclusion: The advantages of the RETRON-Humerus-Shortnail are the intramedullary implant, the high stability of the reconstruction of the fracture with angle stability of the screws and the extraarticular access without any damage to the rotator structures. Because of the adequate results in proximal humerus fractures the RETRON-Humerus-Shortnail is now more often implanted in our hospital than platelet or antegrade nail.

Disclosure: No significant relationships.

T090 Predictive Factors for Functional Outcome and Failure in Angular Stable Osteosynthesis of the Proximal Humerus

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Introduction: Angular stable osteosynthesis has become the golden standard in the treatment of proximal humeral fractures. The aim of this evaluation is to determine the indications for osteosynthesis and for primary arthroplasty based on clinical and radiological properties.

Material and Methods: 383 operatively treated proximal humeral fractures were retrospectively reviewed. Patients were operated between August 2001 and October 2006. Exclusion criteria were pathological fractures and revision osteosynthesis. 368 patients met the inclusion criteria. Preoperative x-rays were used to evaluate displacement, vascularity of the humeral head (according to the Hertel criteria) and AO fracture type. Post-operative X-rays were analyzed for quality of reduction of the CCD angle, reconstruction of the medial hinge and reposition of the tuberosities. Follow-up X-rays were evaluated for healing, avascular necrosis, loss of reduction and implant related failures of osteosynthesis. The ASES

shoulder score was used to evaluate functional outcomes. Anova was used for statistical analysis, with significance set at $p < 0.05$.

Results: 307 files were available on 302 patients. Failure rate was 15.6% at mean follow-up of 4.3 years and a mean ASES-score of 75.3. There was a reoperation rate of 23.8%. Mean age at operation was 62.4 years. Mean operative delay was 4 days (range 0-98). Delay did not influence outcome. Young age at operation was associated with better results. When evaluating fracture characteristics significant better outcomes were evaluated with AO type A- and B-fractures, valgus or neutral fracture type, the presence of impaction and less displaced fractures. Quality of reduction and fixation of the fracture was evaluated with significant better results with anatomic reduction of the medial cortical border, less residual displacement and a CCD-angle that was corrected or in residual valgus. Osteosynthesis failed significantly more in C-type fractures, in fractures with an avascular head fragment, in varus displaced fractures and in fractures where an anatomical reposition was not obtained.

Conclusion: Operative treatment of proximal humeral fractures remains a difficult topic, with a failure rate of 15.6%. Less displaced fractures AO type A or B with associated valgus or neutral head position and impaction have the best results. Further anatomic reduction predicts the best outcome.

Disclosure: No significant relationships.

T091 Prevention of Iatrogenic Damage of the Axillary Nerve in Proximal Humeral Surgery by Defining a Radiographic Safe-Zone Preoperative. An Anatomical Study

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Introduction: Fractures of the proximal humerus are responsible for 4-5% of all fractures. The most extensive used operative treatments are the plate osteosynthesis and the intra-medullary nail fixation with proximal locking nailsscrews. Especially the latter technique can give iatrogenic injury of the axillary nerve. In this study, we define a safe-zone by using radiological parameters

Material and Methods: The following procedure was performed in ten shoulders of embalmed specimen. First, the deltoid muscle was dissected from the clavicle. Then the axillary nerve was identified together with its branches and was marked with clips and radio-opaque wires. The muscle was then re-attached to its anatomical position. Standard AP radiographs were made with the forearm in neutral (anatomical) position and exorotation. On these radiographs, the distance between the cranial side of the humeral head and the axillary nerve and its branches was measured.

Results: The median distance from the head of the humerus to the axillary nerve is 52 mm (SD = 4.5 mm, range 48-58 mm) measured on the AP radiograph in 90 degrees exorotation. The mean number of branches to the deltoid muscle is 3 three. The distances vary from 23 to 78 mm. The median distance from the first proximal branch

measured from to the humeral head is 36 mm (n = 10, range 24-48 mm), to the second branch 54 mm (n = 10, range 40-66 mm), to the third branch 47 mm (n = 6, range 45-52 mm) and to the fourth branch 73 mm (n = 3, range 58-78 mm).

Conclusion: There is a great variation in the course of the axillary nerve and its branches. With the insertion of an intra-medullary nail from the proximal side or by placing locking-screws nails the surgeon has to reckon with the course of this clinically important nerve. It is unsafe to place the locking-screws nail in the zone between 24 mm and 78 mm from the humeral head with the arm in exorotation. The greatest risk to damage the main branch of the axillary nerve is in the zone between 48 and 58 mm. This study provides distances to avoid damage to the axillary nerve. In contrast to the existing literature these distances are measured from the humeral head.

There are several reasons to use the humeral head instead of the acromion are: First, The distance between the humerus and the acromion can vary due to the preceding trauma, relaxation of the deltoid muscle or by manipulation of the arm. Second, from an anatomical perspective, the position of the axillary nerve is determined by the position of the humerus due to the connection to the deltoid muscle.

References: Intramedullary fixation of proximal humerus fractures: do locking bolts endanger the axillary nerve or the ascending branch of the anterior circumflex artery? A cadaveric study. Nijs S, Sermon A, Broos P. Patient Saf Surg. 2008

Is there a safe area for the axillary nerve in the deltoid muscle? A cadaveric study. Cetik O [Et al], J Bone Joint Surg Am. 2006

Disclosure: No significant relationships.

T092 Primary or Secondary Lesions of the Axillary Nerve after Surgical Treatment of Traumatic Proximal Humerus Fracture. Preliminary Results of EMG/ENG Based Study. Failure by Trauma or Approach?

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Introduction: Is the lesion of the axillary nerve caused by the trauma of proximal humerus fracture itself or rather by the surgical approach?

Material and Methods: In the context of a prospective study (EBM Level IIa, Ethic commission No. 328-2007) we were able to include 21 patients who were surgically treated after a proximal humerus fracture. For 19 patients we used a fixed angle plate (HSP; Arthrex), 2 were treated with primary arthroplasty (fracture prosthesis (Arthrex)). For all the operations we chose the anterolateral Deltasplit approach. Pre-operative and post-operative EMG/ENG as well as constant score has been recorded for all patients.

Results: 15 EMG/ENG records were without pathologic variances of the axillary nerve. 5 of them pre-operatively showed pathologic variances. 2 of these 5 continued to show variances 3 months after the operation, which indicates a chronic lesion. Just one patient showed a pathologic ENG after surgery which was not seen before. The constant score was as expected. (3-M(n = 18): 53; 6-M(n = 17) 71; 12-M(n = 9) 75.

Conclusion: The lesion of the axillary nerve is often caused by the trauma itself (24%). Lesion caused by the anterolateral approach is less often seen than expected. The anterolateral approach is a save procedure to treat proximal humeral fractures.

Disclosure: No significant relationships.

KNEE – FOOT

T093 Patellofemoral Pain and Knee Instability due to Recurrent Patella Dislocation. Treatment with Oblique Tibial Tubercle Osteotomy and Soft Tissue Balancing

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Introduction: Patella recurrent dislocation and patellofemoral pain syndrome is a common cause of instability in young patients and especially athletes. In the present study we present the results of the extension mechanism realignment throughout the Fulkerson oblique osteotomy of the tibial tubercle and soft tissue balancing.

Material and Methods: During the last two years 11 patients (7men, 4 women, mean age 29.6/ range 20-39) were treated operatively for recurrent dislocation of the patella using the Fulkerson procedure. All our patients had as onset a traumatic dislocation of the patella that developed to recurrent. All patients were underwent knee arthroscopy for the treatment of potential chondral trauma or loose bodies removal and lateral retinaculum release. After that, we performed oblique osteotomy of the tibial tubercle, medialization and internal fixation with two cortical screws. This oblique osteotomy provides additionally to the medialization, anteriorization of the tibial tuberosity as we move it medially. Moreover we perform medial plication. All patients used functional brace locked in 0° immediately after the operation and gradual ROM increase until the 8th p.o. week.

Results: The patients had no initial or long term complication. During their last follow up examination had a painless knee with full ROM and marked improvement of the patella tracking. The mean Lysholm score was improved from 63.2 to 90.5. No patella dislocation was referred.

Conclusion: Our findings show that Fulkerson procedure of the tibial tubercle osteotomy and anteriomedialization, with additional intervention on the lateral and medial patella retinaculum is an excellent option for the treatment of recurrent patella instability and relief of patellofemoral pain.

Disclosure: No significant relationships.

T094 Osteoarthritis in Athletes with ACL Reconstruction After Isolated ACL Rupture? A Postoperative Follow-Up with a 3 T-MRI of Both Legs after ACL Reconstruction Using Patellar Tendon or Hamstrings Tendon Grafts in 28 Athletes Returning to Pre-Injury Sports

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Introduction: Injuries to the knee involving the anterior cruciate ligament (ACL) are very common related to sports especially in soccer and skiing. More than 50% of those with ACL injury will develop radiographic osteoarthritis (ROA) within 15 years of injury although it is not known if return to sports is a risk factor for longitudinal ROA development. In this retrospective study, we evaluated the long term radiographic and clinical results of ACL reconstruction by comparing the injured knee with the contralateral knee in athletes returning to pre-injury sports.

Material and Methods: Twenty-eight patients (20 men and 8 women, mean age 20 years at the time of ACL surgery, BMI 24.9 ± 2.9 kg/m²) were studied. Patients returning to previous sports and without meniscal injury at baseline were selected. ACL reconstruction was performed using patella tendon or hamstrings tendon graft. Radiological assessments using X-ray and a 3-T MRI of both legs were obtained at a mean follow up of 8 years after ACL reconstruction. ROA was determined according to the classification of Bohndorf. The IKDC score and Tegner activity index were used for clinical evaluation and the Knee Injury and Osteoarthritis Outcome Score (KOOS) for evaluating self-reported knee function.

Results: The 3-T MRI revealed positive signs of ROA on the operated knee in 36% and on the non-operated knee in 25%. These changes were however limited to small localized areas of the knees. The statistical difference of morphological and clinical outcome of ACL reconstructed patients 4 weeks after injury vs. replacement after this period showed no significance ($p = 0.09-1.0$). The total IKDC score was 89.2 ± 9.3 points and the total KOOS was 92.7 ± 7.8 . The median pre-injury Tegner score was 8 (range 3- 9) corresponding to 7 (range 3-9) at follow up. In 68% of the patients the Tegner score was unchanged from pre-injury to follow up. According to the IKDC score 61% had type A symptoms, 36% type B, 3% type C, and none type D.

Conclusion: Eight years after ACL reconstruction in athletes returning to pre-injury sports, the risk of developing knee ROA in the injured knee was not higher than the risk of developing ROA in the contra lateral knee.

Disclosure: No significant relationships.

T095 Treatment Algorithm for Acute Isolated PCL Ruptures in Dependence of the Classification According to Harner: Preliminary Results

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Introduction: Unlike anterior cruciate ligament injuries, ruptures of the posterior cruciate ligament (PCL) have a good healing potential. Therefore, management of acute isolated PCL injuries remains controversial. We want to introduce our algorithm for the treatment of acute PCL injuries and present preliminary results.

Material and Methods: In the time from January 2005 until September 2008 45 patients (28 male, 17 female) with acute, isolated PCL ruptures were included in this study. Radiographs and a MRI of the knee were available for all patients. All patients were followed prospectively and Lysholm, Tegner and IKDC score were surveyed before treatment and after at least 12 months. After diagnosis, a brace immobilization with tibial supporter with full extension of the knee was applied for 6 weeks followed by another 8 to 12 weeks of PCL brace with tibial supporter and posterior elastic rubber band to prevent posterior sagging of the proximal tibia. All patients received concomitant physiotherapy. After at least 6 weeks, stress radiographs were taken for evaluation of the PCL. The further treatment depended on the Harner classification based on the stress radiographs. In cases of grade A or asymptomatic grade B injuries, conservative treatment was continued. In cases of symptomatic grade B, grade C or D injuries, operative treatment with arthroscopic transtibial PCL reconstruction using single bundle hamstring tendons was performed.

Results: 27 patients were treated conservatively (group I), 18 patients had an arthroscopic PCL reconstruction (group II). Mean patient age was 30.7 years (range 17 - 50 years). The mean Tegner score in group I raised from 2.5 before treatment to 5 at follow up, in the operative group from 2.4 to 4.6. The mean Lysholm score ascended in the conservative group from 49 to 83, in group II from 42.2 to 76. Considering the ligament module of IKDC before treatment, there were 18 patients (40%) in category D, 20 patients (44%) in category C and 7 patients (16%) in category B. At follow up the IKDC ligament module in group I was: 19 patients (70.4%) in category A, 8 patients (29.6%) in group B. For group II: 9 patients (50%) category A, 7 patients (38.9%) in category B and 2 patients (11.1%) in category C.

Conclusion: The results of the presented treatment algorithm utilizing at first brace immobilization with a tibial supporter and performing operative treatment in dependence of the Harner classification are promising. It may be one of the recommendable treatment methods in an isolated and acute PCL injury.

References: Harner CD (1996) The posterior cruciate ligament overview. AM Academy Orthop Surg Instructional Course

Disclosure: No significant relationships.

T096 Arthroscopy Education Through Virtual Reality 3D Arthroscopy Surgical Simulators – Visomotoric Capacity

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Introduction: The virtual reality (VR) 3D arthroscopy surgical simulator provides arthroscopy training on knees in a controlled, stress-free, and virtual-reality environment. It is unknown whether better visomotoric three-dimensional (3D) condition will facilitate arthroscopic training. Therefore, our objective was to evaluate the visomotoric condition to novice individuals and assess whether visomotoric abilities ameliorates arthroscopic performance within a 2D surgical environment.

Material and Methods: 164 medical students without any knee arthroscopic experience were investigated. Both groups received a fixed protocol of simulator based arthroscopic skills training and a visomotoric skills test. This consisted of an arthroscopy of a longitudinal meniscus tear on a VR knee arthroscopy simulator. Their learning curve was assessed objectively using motion analysis. Time taken, path length and roughness for probe and camera were recorded.

Results: Motion analysis demonstrated objective improvement in performance during simulator training, if visomotoric skills performed better.

Conclusion: Better condition of visomotoric skills lead to subsequent improvement at an arthroscopic VR skills training simulator. This may assume that visomotoric skills training before arthroscopic VR skills training is a useful tool. However further studies are necessary to find preliminary practice exercises to get a better performance at an arthroscopic VR skills training simulator.

Disclosure: No significant relationships.

T097 Orthopaedic Trauma Damage Control of Distal Tibial Fractures

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Introduction: Fractures of distal tibia they are high energy traumas, which are mostly associated with serious injuries and polytraumas. More of these fractures they are comminuted and intraarticular fractures associated with soft tissue damage and their treatment is complex according to orthopaedic trauma damage control.

Material and Methods: Our Trauma protocol for distal tibial fractures :
Diagnosis and first examination : - X-ray – AP, lateral - CT examination o classic scans o 2D and 3D reconstruction - fracture classification o type of the fracture – AO classification o soft tissue damage § closed fractures – Tscherne classification § open fractures – Gustilo classification Complex treatment of the fracture and soft tissues - primary, urgent and definitive stabilisation o kind of fracture : § closed fractures C-0 and C-I after Tscherne § open fractures O-I fractures after Gustilo o type of osteosynthesis § ORIF with LCP distal tibia plates – medial or anterolateral § interlocked intramedullary nail - orthopaedic trauma damage control o kind of fracture §

closed fractures C-II and C-III after Tscherne § open fractures O-II and O-III after Gustilo o urgent operative treatment § first stabilisation with miniosteosynthesis and external fixation § soft tissue debridement and their temporary closure o second look after 48 – 72 hours, next looks after the soft tissue condition o delate treatment – definitive stabilisation – osteosynthesis conversion in 7 – 10 days after injury. o type of osteosynthesis § ORIF with LCP distal tibia plates – medial or anterolateral § interlocked intramedullary nail § external fixation - in cases of serious soft tissue defects we prefer fracture stabilisation · serious soft tissue defects closing with rotation or microsurgery stem lobs.

Results: In 2004 – 2008 they were treated 107 fractures of distal tibia. Primary osteosynthesis in 51 fractures, 32 with LCP plates and 19 with interlocked nailing. Orthopaedic trauma damage control was accepted in 56 fractures, closed fractures C-II – 23, C-III – 14, open fractures O-II – 11 and O-III 8, lobs plasty in 14 fractures. Complications : infect in 9 cases, 3 at closed fractures and 6 at open fractures, pseudoarthrosis in 11 cases, implants failure in 6 cases. Functional results : good 63, satisfy 31, poor 13 patients.

Conclusion: Treatment of distal tibia fracture after our traumaprotocol and according orthopaedic trauma damage control leads to the small rate of complications, especially at serious soft tissue damage. Cooperation with plastic surgeon have a great importance. Good timing and early conversion and indication for acceptable kind of osteosynthesis (LCP or interlocken nailing) leads to good results and decreasing of complications and functional consequences.

Disclosure: No significant relationships.

T098 Angle Stable System in the Management of Fractures of Distal Tibial Metaphysis

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Introduction: Fractures of the distal tibial metaphysis account for 7.2% of fractures over the distal end of the tibia. Many of them are high-energy injuries causing extensive articular damage and compromise the soft tissues. Managing these fractures continues to challenge most orthopaedic surgeons, as soft tissue injury could be further compromised by unjudicious surgical technique. Aim of the treatment is to restore physiological alignment of the distal tibia and stabilize the fracture with minimal damage to soft tissues.

Material and Methods: We designed an implant for the stabilization of distal tibial metaphyseal fractures, and gave the name “angle stable”. The features of the implant are: precontoured plate with holes above the distal metaphysis providing positioning of screws with angular stable characteristics. The screws are self tapping and self cutting at the threaded part (far end) and have a cylindrical shape with a rim at the near end, that tightly fits into the holes at a special angle, guided by a targeting device. The distal screws penetrate the opposite cortex, and when they are tightened, compression is achieved. The plate is introduced through a small incision and guided onto the surface of distal tibia. 4 screws can be inserted distally, proximal screws are inserted through stab wounds. Biomechanical tests of this system were performed on cadaver bones. Since 2005 the “angle stable” system has been used in 41 patients in 35 cases as a primary stabilization, and in 6 cases as conversion of external fixation. Follow-up time was 18 months. Outcome was assessed with regard to function, pain and alignment.

Results: Redisplacement of fracture has not been noticed. Superficial infection occurred in 2 cases. 63,4% of patients were assessed as excellent or good, 29,2% fair and 7,4% poor .

Conclusion: The „angle stable” implant system provides minimally invasive stabilization of distal tibial metaphyseal fractures and can be recommended for the management of these difficult injuries, bearing in mind, that technology does not replace surgical judgment!

References: 1. Interlocking nails for displaced metaphyseal fractures of the distal tibia Cheng-Yu Fan et al. Injury, 2005.36.5. 2. Treatment of distal metaphyseal fractures: plating versus shortened intramedullary nailing Shang Wei Yang et al. Injury 2006.(37) 531- 535 3. Locking plate fixation in distal metaphyseal tibial fractures Rakesh K. Gupta et al. International Orthopaedics (SICOT) DOI **10.1007/s00264-009-0880-4**

Disclosure: No significant relationships.

T099 Results of a Two-Staged Regimen for Severe Fractures to the Pilon

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Introduction: The fracture of the distal lower limb with or without participation of the ankle joint remains a challenge to the surgeon. Due to the high energy released at the time of fracture, these injuries are usually accompanied by a severe soft-tissue damage. The success of the surgical therapy of tibial pilon fractures depends largely on the extent of the soft tissue damage as well as the quality of reconstruction of the tibial joint surface. A problem of the minute anatomical reconstruction is an increase in soft tissue problems and bone infection. Aim of this study was to investigate the results gained by a primary stabilization by external fixator followed by a multidirectional locked plate osteosynthesis after soft tissue consolidation.

Material and Methods: Setting is a level 1 trauma centre, the design a consecutive series with a retrospective data evaluation. Between 2002 and 2005, 42 patients with high-energy fractures of the tibial plafond were treated using a two-staged treatment plan: 1. the fracture was stabilized with an external fixator immobilizing the ankle joint. 2. after stabilization of the soft tissue situation (mean 9.2 days) internal fixation with a locked-screw plate was performed. The implant used was a multi-directional locking internal plate fixator (Tifix, LITOS, Hamburg/Germany), made of pure titanium with locking holes for titanium screws which can be fixed in different angles and is available in seven different lengths (3–7 holes in the diaphyseal area). The mean follow-up time was 27.8 months. All follow-up examinations were supervised by a specialized orthopedic trauma Surgeon. The examination consisted of a set of standardized questions, clinical evaluation, the AOFAS Score and radiographs.

Results: Superficial wound-necrosis was noted 3 times, conservative treatment led to complete wound healing. DVT of the injured leg occurred in 2 cases. In 2 cases autologous bone graft was necessary after 2 and 3 months. Deep wound infection or postoperative osteomyelitis was not observed. The definitive treatment was performed after an average of 9.6 days. In 9 cases an autologous bone graft was used. In a further 2 cases a later autologous bone graft was performed

for delayed union at 9 and 13 weeks after ORIF. Full weight bearing was reached after an average of 11.8 weeks. Bony union was achieved in all cases after an average of 4.1 months as determined by conventional radiographs. In 6 cases range of motion (ROM) of the ankle did not show any restriction compared to the opposite side. In 18 cases the range of motion was reduced by less than 1/3 compared to the opposite side, of up to 2/3 in 14 patients and restriction of > 2/3 was not noted in 4 cases. The mean AOFAS Score was 73.4.

Conclusion: A twostage treatment plan in fractures of the distal lower limb with external fixation followed by locked-plate osteosynthesis reduces local complications with a good functional result.

Disclosure: No significant relationships.

T100 The Novel Technique for Complex Distal Tibial Fractures. A Report of Two Cases

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Introduction: The internal fixation for complex distal tibial fractures is sometimes challenging. Nowadays, successful outcome were reported about osteosynthesis through medial and anterior approaches including minimally invasive plate osteosynthesis (MIPO). However, there are cases in which such methods are not indicated because of their soft tissue problems or their fracture pattern. In this presentation, the new posterior plating procedure using the MIPO technique is reported.

Material and Methods: This procedure was indicated only when no other internal fixation methods were present, which includes intramedullary nailing or medial/anterior plating, were found. So the indication for this procedure was extremely rare. From 2005 to 2009, 34 cases of AO classification 43-A and C type fractures were treated operatively in our institution. 2 cases met the criteria. Both of them were female and aged 66 and 37. The follow up period was 24 and 12 months. The procedure was as follows; Before the operation, the spanning external fixator was applied and the alignment was reduced as properly as possible. The patient was in the supine position and the knee was flexed at about 90 degrees. The distal window for MIPO was positioned between the distal fibula and achilles tendon, which is called a "Posterolateral approach." Blunt dissection was performed, and exposed the edge of the flexor hallucis longus muscle (FHL). The tunnel over the periosteum at the posterior surface of the distal tibia was made and the plate was inserted. Then an incision was made at the posteromedial border of the tibial shaft and exposed the proximal part of the plate (Proximal window). The plate was placed properly under the image intensifier and fixed with screws. The wounds were irrigated and sutured in layers. Postoperative rehabilitation included a range of motion exercise and non-weight bearing gait and use of crutches immediately begun. Full weight bear was permitted around twelve weeks post operatively. Time to union, complication and final ambulatory ability were evaluated.

Results: Bony union was uneventfully completed within three months in both cases. There were no complications such as infection, skin problems, or plate irritation/impingement. Free gait was achieved within four months in both cases.

Conclusion: Posterior plating using the MIPO procedure for complex distal tibial fractures can be a good option, although our experience is very limited. However, this procedure should be indicated only when no other osteosynthetic methods are found because irritation/impingement of the FHL or the achilles tendon or some other complications may arise, which has already been reported in open reduction and internal fixation through posterolateral approach.

References: Hayes AG, Nadkarni JB. Extensile posterior approach to the ankle. J Bone Joint Surg 1996;78B:468-470.

Disclosure: No significant relationships.

RESEARCH

T101 Prospective Randomized Study on the Treatment of Peripheral Nerve Lesions with an Adaptive Nerve Prosthesis

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Introduction: Even the most modern technology has failed to induce satisfactory functional regeneration of traumatically severed peripheral nerves. Delayed neural regeneration and in consequence slower neural conduction seriously limit muscle function in the area supplied by the injured nerve. This inferiority study aimed to compare a new nerve coaptation system involving an innovative prosthesis with the classical clinical method of sutured nerve coaptation. Besides the time and degree of nerve regeneration, the influence of electrostimulation was also tested.

Material and Methods: The ischiatic nerve was severed in 14 female Göttinger minipigs with an average weight of approx. 35-40 kg. The animals were randomized electronically to four groups: Group I: nerve prosthesis without stimulation; Group II: nerve prosthesis with stimulation; Group III: microsurgical coaptation without stimulation; Group IV: microsurgical coaptation with stimulation. In groups III and IV, the nerve was sutured microsurgically, while the animals in groups I and II received the new nerve prosthesis. Postoperative monitoring and the stimulation schedule covered a period of 9 months, during which axonal budding was evaluated monthly.

Results: Preliminary data indicate that results with the nerve prosthesis are comparable to those with conventional coaptation.

Conclusion: The results of this pilot study indicate that implantation of the nerve prosthesis allows good and effective neural regeneration. This new and simple treatment option for peripheral nerve injuries can be performed in any hospital with surgical facilities as it does not involve the demanding microsurgical suture technique that can only be performed in specialized centers.

Disclosure: No significant relationships.

T102 Using BMP-7 in Treatment of Long Bone Non Unions. A Report of a Case Series of 285 Patients

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Introduction: Since 2002 Bone Morphogenic Proteine 7 (Osigraft Stryker) is used in treatment of long bone non unions or in filling of great bone defects. The aim of the study is to give answers whether the use of BMP in bone healing problems can increase the healing rate of the multifactorial treatment of such complicated cases.

Material and Methods: As standart of care we treated bone healing problems according to the Diamond Concept. Since 2002 up to now, each case, treated by BMP 7 is prospectively included in a data base. There is no exclusion criteria for the data collection. Unsystematically the patients are investigated afterwards. The results of the multifactorial treatment is analysed by a clinical and a radiological 10 points score. The healing time is registered. Interventions are also noticed as side effects of the treatment. Up to now 511 treatment are included. 285 cases are completed. 39 are lost of follow up. 69 persons are female, age is 19-85 years (MW 53). 216 persons are male, age is 22-91 years (MW 59). In mean there were 5,6 previous operations. In 166 cases a change of osteosynthesis was necessary. In 42 cases BMP 7 was used alone. In 223 cases BMP7 was expanded by autologous bone grafting. In 21 cases the BMP was extended by autografts or ceramic scaffolds.

Results: Divided in a healing group and a not healing group we found in the healing group a excellent clinical result by 8.9 Points (able for sports) for the atrophic non unions and a good result of 8.1 points (walking long distances) for the post infected non unions. The radiological score is as high 8.1 / 7.9 (3 cortices healed and bridging callus). In the non healing group the clinical rate was 5.5 / 4.9 (walking with splint) and the radiological rate was 4.9 / 3.4 (two cortices healed) The overall healing rate was 79%. Divided in several groups the healing rate increases from 68% (infected non unions not tibia) to 93% (atrophic aseptic non union tibia). Overall the secondary intervention rate was 14%. The healing time is 6.5 months in the middle. We see only mild side effects in 6%, like swelling. The most serious complication was the bony reinfection in 9%. There were 2 amputations.

Conclusion: Compared to the literature the healing rate of non unions could be increased using a strong concept in the treatment. As a part of the treatment the BMP treated group increases the healing rate from 81% (Friedländer) to 93%. The results are similar to the papers from Kanakaris or Zimmermann. There were no significant side effects noticed.

References: Kanakaris K. et al (2008): Application of BMP-7 to tibial non-unions: A 3 Year multicenter experience. *Injury*, 39S2, 83-90.

Zimmermann G. (2007): Therapieerfolg bei atrophischen Tibiaschaftpseudarthrosen. *Unfallchirurg*, 110, 931-938
Friedländer G. (2001): Osteogenic Proteine 1 (BMP7) in the treatment of tibial non unions. *JBCS*, Vol 83A, S1-151

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T103 Bone Growth Augmentation: Are we Really Helping?

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Introduction: Recent studies have demonstrated that nonoperative treatment of displaced midshaft clavicle fractures have a high prevalence of symptomatic malunion and nonunion with nonoperative treatment. 8-10 Although good results have been demonstrated with open reduction internal fixation (ORIF), complications still exist thus fixation was augmented. This retrospective study was undertaken to compare the results of open reduction and internal fixation (ORIF) alone compared with ORIF augmented with either bioresorbable calcium phosphate cement or autogenous bone grafting of acute displaced, midshaft clavicle fractures.

Material and Methods: Methods: At our level I trauma institute, from July, 2007 to September, 2008 each patient who presented with a clavicle fracture that was deemed operative received plate fixation alone or supplemented with bioresorbable calcium phosphate cement or autogenous bone grafting. Patient records and radiographs were retrospectively reviewed. Follow-up included standard radiographs to evaluate union at a minimum of 6 months. All complications were also reviewed.

Results: Results: Two different clavicle plating systems, Smith and Nephew (Smith and Nephew, Memphis, USA) (23 clavicles) and Implant Technology Systems (I.T.S., Lassnitzhohe, Austria) (30 clavicles), were used with ORIF alone (11), autogenous bone graft (14 patients), or bioabsorbable calcium phosphate (28 clavicles). Of 53 patients treated with open reduction internal fixation, 6 complications have occurred at a minimum of 6 month follow-up. Three prominent hardware occurrences necessitated plate removal. One nonunion, one distal screw cut-out and one hardware breakage have been treated successfully with revision plating. Using Fisher's exact test, no statistical significance was seen between the ORIF alone, autogenous bone grafting (2) and bioabsorbable calcium phosphate (4) in regard to overall failure incidence (p = 0.66). Complications necessitating revision ORIF with bioabsorbable calcium phosphate (2) and bone graft (1) were not statistically significant either (p = 0.73).

Conclusion: Conclusion: There appears to be no statistically significant difference between union and complication rates between ORIF alone, or ORIF augmented with bioresorbable calcium phosphate cement or autogenous bone graft in this retrospective study.

References: 1. Crenshaw AH. Fractures of the shoulder girdle, arm and forearm. In: Crenshaw AH, editor. *Campbell's operative*

orthopaedics. 8th ed. St. Louis: Mosby YearBook; 1992. p 989-1053. 2. Neer C. Fractures of the clavicle. In: Rockwood CA Jr, Green DP, editors. Fractures in adults. 2nd ed. Philadelphia: Lippincott; 1984. p 707-13. 3. Stanley D, Trowbridge EA, Norris SH. The mechanism of clavicular fracture: a clinical and biomechanical analysis. *J Bone Joint Surg Br* 1988;70B:461-4. 4. Rowe CR. An atlas of anatomy and treatment of midclavicular fractures. *Clin Orthop Relat Res*. 1968;58:29-42. 5. Neer CS 2nd. Nonunion of the clavicle. *JAMA*. 1960;172:1006-11. 6. Rowe CR. An atlas of anatomy and treatment of midclavicular fractures. *Clin Orthop* 1968;58:29-42. 7. Allman FL. Fractures and ligamentous injuries of the clavicle and its articulation. *J Bone Joint Surg Am*. 1967;49A:774-784. 8. McKee MD, Schemitsch EH, Stephen DJ, Kreder HJ, Yoo D, Harrington J. Functional outcome following clavicle fractures in polytrauma patients [abstract]. *J Trauma*. 1999;47:616. 9. Hill JM, McGuire MH, Crosby LA. Closed treatment of displaced middle-third Fractures of the clavicle gives poor results. *J Bone Joint Surg Br*. 1997;79: 537-9. 10. Nordqvist A, Petersson CJ, Redlund-Johnell I. Mid-clavicle fractures in adults: end result study after conservative treatment. *J Orthop Trauma*. 1998;12:572-6. 11. McKee MD, Pederson EM, Jones C, et al. Deficits following nonoperative treatment of midshaft clavicle fractures. *J Bone Joint Surg* 2006;88A:35-40. 12. Zlowodzki M, Zelle BA, Cole PA, Jeray K, McKee MD. Evidence-Based Orthopaedic Trauma Working Group. Treatment of midshaft clavicle fractures: systemic review of 2144 fractures: on behalf of the Evidence-Based Orthopaedic Working Group. *J Orthop Trauma*. 2005;19:504-7. 13. McKee MD, Kreder HJ, Mandel S, et al (The Canadian Orthopaedic Trauma Society). Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. *J Bone Joint Surg*. 2007;89A:1-10. 14. Celestre P, Roberston C, Mahar A, et al. Biomechanical evolution of clavicle fracture plating techniques: does a locking plate provide improved stability? *J Orthop Trauma*. 2008;22:241-7. 15. Bostman O, Manninen M, Pihlajamäki H. Complications of plate fixation in fresh displaced midclavicular fractures. *J Trauma: Injury Infect Crit Care*. 1997;43:778-83. 16. Kloen P, Sorokin AT, Rubel IF, et al. Anteroinferior plating of midshaft clavicular nonunions. *J Ortho Trauma*. 2002;16:425-430. 17. Collinge C, Devlin S, Herscovici D, et al. Anterior inferior plate fixation of middle-third fractures and nonunions of the clavicle. *J Orthop Trauma* 2006;20:680-88. 18. Harnroongroj T, Vanadurongwan V. Biomechanical aspects of plating osteosynthesis of transverse clavicular fracture with and without inferior cortical defect. *Clin Biomech*. 1996;11:290-4. 19. Iannotti MR, Crosby LA, Stafford P, et al. Effects of plate location and selection on the stability of midshaft clavicle osteotomies: a biomechanical study. *J Shoulder Elbow Surg* 2002;11:457-462. 20. Russel TA, Leighton RK, et al. Comparison of autogenous bone graft and endothermic calcium phosphate cement for defect augmentation in tibial plateau fractures. A multicenter, prospective, randomized study. *J Bone Joint Surg*. 2008;90:2057-2061. 21. Bioemers FW, Blokhuis TJ, Patka P, Bakker FC, Wipperfmann BW, et al. Autologous bone versus calcium-phosphate ceramics in treatment of experimental bone defects. *J Biomed Mater Res B Appl Biomater*. 2003;66:526-31. 22. Fowler BL, Dall BE, Rowe DE. Complications associated with harvesting autogenous iliac bone graft. *Am J Orthop*. 1995;24:895-903. 23. Seiler JG III, Johnson J. Iliac crest autogenous bone grafting: donor site complications. *J South Orthop Assc*. 2000;9:91-97. 24. Younger EM, Chapman MW. Morbidity at bone graft donor sites. *J Orthop Trauma*. 1989;3:192-5. 25. O'Keefe RM Jr, Riemer BL, Butterfield SL. Harvesting of autogenous cancellous bone graft from the proximal tibial metaph-

ysis. A review of 230 cases. *J Orthop Trauma*. 1991;5(4):469-74. 26. Geideman W, Early JS, Bordsky J. Clinical results of harvesting autogenous cancellous graft from the ipsilateral proximal tibia for use in foot and ankle surgery. *Foot Ankle Int*. 2004; 25(7):451-5. 27. Park KW, Dickerson C. Can efficient supply management in the operating room save millions? *Curr Opin Anaesthesiol*. 2009; 22(2):242-8. 28. Tashjian RZ, Horwitz DS. Healing and graft-site morbidity rates for midshaft clavicle nonunions treated with open reduction and internal fixation augmented with iliac crest aspiration. *Am J Orthop*. 2009; 28:133-136. 29. Shors EC. The development of coralline porous ceramic bone graft substitutes. In: Laurencin CT, editor. Bone graft substitutes. West Conshohocken, PA: ASTM International; 2003: 271-88. 30. De Long WG Jr, Einhorn TA, Koval K, McKee M, et al. Bone grafts and bone graft substitutes in orthopaedic trauma surgery. *J Bone Joint Surg* 2007;89(A):3:649-58.

Disclosure: No significant relationships.

T104 Strontium Ranelate Enhances More Callus Strength than PTH 1-34 In An Osteoporotic Rat Model Of Fracture Healing

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Introduction: The purpose of the present study was to determine the effect of two anti-osteoporotic treatments on fracture healing in osteoporotic OVX rats, 28 days after fracture occurrence. PTH which has been proven to influence fracture healing in OVX rats, was taken as a control treatment. Strontium ranelate is acting on both resorption and formation. We combined the rat model of a closed, standardised diaphyseal fracture of the femur with the model of a post-ovariectomy osteopenic rat, mimicking post-menopausal bone loss.

Material and Methods: Forty-five animals were ovariectomised at the age of 12 weeks and a further 15 were sham operated. At the age of 24 weeks, osteopenia in the OVX rats was diagnosed. Then, in all animals, a standardised mid-diaphyseal fracture was induced. At the time of fracture, the animals were divided into four groups. Group 1 was the SHAM control group, Groups 2, 3 and 4 were the OVX treatment groups. Groups 1 and 2 were treated with NaCl 0.9% s.c. daily, Group 3 was treated with 600 mg/kg/d strontium ranelate p.o. daily and Group 4 received 20 µg PTH 1-34 3x/week s.c. The animals were killed after 28 days and the fractured femur removed. The samples were scanned using MicroCT 80 by Scanco Medical, Zurich, Switzerland. The evaluation of the data focused on outer callus contour, cortical contour and marrow contour as well as cortical thickness. Torsion testing on the bones was carried out using the axial-torsional 8874 system by Instron (Darmstadt, Germany).

Results: Treatment with strontium ranelate significantly improved the mechanical properties of the callus when compared to the OVX control group, while the improvement induced by the treatment with PTH 1-34 did not reach significance. PTH 1-34 and strontium ranelate both showed a significant increase in bone volume of the callus when compared to OVX control rats with no significant difference between the two treatments. As for the callus tissue volume, the

increase induced by strontium ranelate was significant compared to OVX whereas PTH induced no change and the difference between both drugs was significant. In both the PTH 1-34- and strontium ranelate-administered animals BV/TV was significantly increased compared to the OVX control rats. The BV/TV of the PTH-treated rats was even higher than in the SHAM rats.

Conclusion: This is the first report on the enhancement of fracture healing with strontium ranelate. The callus in strontium ranelate-treated animals is even more resistant to torsion in comparison to OVX and SHAM-untreated animals and even to those treated with PTH 1-34. PTH did not significantly enhance the resistance of the callus versus OVX, despite a significant increase in BV/TV within the callus. The superior results obtained with strontium ranelate compared to PTH could be the consequence of a better quality of the new bone formed within the callus.

Disclosure: No significant relationships.

T105 Hyperhomocysteinemia is not Associated with a Reduced Quality of Human Bone

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Introduction: Recent clinical and animal studies suggest an elevated homocysteine serum concentration to be a risk factor for osteoporosis and fragility fractures (1). In vitro studies showed that increasing homocysteine concentrations stimulate the activity of human osteoclasts (1). However, there is no data demonstrating that circulating homocysteine is related to structural and biomechanical properties of human bones. This study aimed to investigate the relation between morphological as well as biomechanical bone properties and homocysteine serum concentrations in humans.

Material and Methods: Fasting blood samples and femoral heads were obtained from 94 males and females who underwent hip arthroplasty. Bones were assessed by dual energy X-ray absorptiometry (DXA), biomechanical testing (indentation method), and histomorphometry. Blood was sampled to measure homocysteine, folate, vitamin B6, and vitamin B12. According to their homocysteine serum concentration, subjects were classified as hyperhomocysteinemic ($> 12 \mu\text{mol/L}$, $n = 47$) and normohomocysteinemic ($< 12 \mu\text{mol/L}$, $n = 47$).

Results: Folate and vitamin B6, but not vitamin B12, were significantly lower in hyperhomocysteinemic subjects when compared to controls. However, DXA, biomechanical testing, and histomorphometry did not reveal significant differences in bone quality between hyperhomocysteinemic subjects and controls.

Conclusion: The results of the present study do not indicate a significant relation between circulating homocysteine and morphological as well as biomechanical bone properties.

References: 1. Herrmann M, Peter Schmidt J, Umanskaya N, Wagner A, Taban-Shomal O, Widmann T, et al. The role of hyperhomocysteinemia as well as folate, vitamin B(6) and B(12) deficiencies in osteoporosis: a systematic review. *Clin Chem Lab Med* 2007;45:1621-32.

Disclosure: No significant relationships.

T106 Long Bone Defects can be Better Treated with Allogeneic Platelet Gel with Autologous Bone Transplant. Clinical Study Results

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Introduction: Sometimes fractured bones heal poorly with standard treatment and sometimes a bone defect is a major problem. Although the bone grafting technique is considered a standard, there is a need for enhancement of this procedure. Healing of the cancellous bone is a complex process in which many inflammatory and signaling molecules take part. To improve the outcome of the healing process, one can influence it by applying platelet rich plasma gel locally, thereby releasing cytokines and growth factors (1). Cancellous bone is rich with mesenchymal stem cells that produce new bone when stimulated.

Material and Methods: We enlisted 8 patients with hard to heal fractures and fractures that demonstrated poor healing in the study. Five of the patients had osteomyelitis in the fracture and all fractures resulted in a bony defect as a serious complication after treatment. We designed a protocol for the preparation of allogeneic platelet rich plasma gel with suspended autologous cancellous bone, based on laboratory experiments in vitro (2). Cancellous bone was harvested from iliac bone crest. We used standard AB0 and RhD identical, leukocyte depleted and irradiated platelets from a blood bank. Activation of the platelet gel was achieved by using a CaCl₂ and thrombin mixture. We accepted patients after fulfilling the inclusion criteria and they were operated on in a standardized manner by their elected surgeons under technical supervision. In their follow-up, the ingrowths of bone grafts were measured by using x-ray analysis (3).

Results: In 6 patients the transplant was sufficiently incorporated in the fracture to give a limb full function. There were no major complications related to the platelet rich plasma additives. In one patient a nerve paresis was observed, which resolved spontaneously. In 2 patients bone graft was not sufficiently incorporated, once because of poor compliance and the other time because of complex nature of distal tibia fracture. The clinical outcome of the operated patients (75%) is satisfactory and encouraging.

Conclusion: The preliminary clinical results show that using platelet rich plasma and cancellous bone in the treatment of large bone defects has a promising therapeutic potential.

References:

- (1) Marx RE. Platelet-rich plasma: evidence to support its use. *J Oral Maxillofac Surg* 2004; 62(4):489-496.
- (2) Kevy SV, Jacobson MS. Comparison of methods for point of care preparation of autologous platelet gel. *J Extra Corpor Technol* 2004; 36(1):28-35.
- (3) Franchini M, Dupplicato P, Ferro I, De GM, Aldegheri R. Efficacy of platelet gel in reconstructive bone surgery. *Orthopedics* 2005; 28(2):161-163.

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T107 Traumatic Hip Dislocations and ApoptosisA. K. B. Wikeroy¹, S. A. Ovre¹, F. Reinholt², J. E. Madsen¹, O. Roise¹¹Orthopaedic, Ulleval University Hospital, Oslo, Norway,²Pathology, Oslo University Hospital, Oslo, Norway

Introduction: Traumatic hip dislocation is a surgical emergency. Posttraumatic function probably depends on time until reduction and severity of fracture dislocation. Studies indicate that reduction should be done within 6 hours¹ to avoid arthritis and avascular necrosis. Causes of these complications may be: 1. An incongruent joint. 2. Lack of blood supply 3. Necrosis of the chondrocytes because of trauma. Chondrocytes are essential for regeneration of cartilage. 4. Apoptosis, an energy demanding preprogrammed process where the chondrocytes commit suicide. Several works show a probable correlation between degree of chondrocyte apoptosis and development of arthritis²⁻⁶. Our hypothesis is that trauma towards cartilage induces apoptosis. The degree of apoptosis may be proportional to the energy of trauma and to time before reduction. Much research is now done on the possibility of reducing apoptosis of chondrocytes, and thereby slowing the development of arthritis. The aim of this study is to prove apoptosis of chondrocytes in vivo after traumatic hip dislocations, and to see if the degree of apoptosis correlates with time to reduction and operation.

Material and Methods: 23 patients with acetabular dislocation fractures with loose cartilage fragments too small to be reinserted were included prospectively from August 2007 to January 2009. Inclusion is still ongoing. Time from injury to reduction and to surgical intervention was noted. Apoptosis was verified by microscopy with TUNEL, hematoxylin and eosine stained specimens after decalcification of the samples, a time consuming process. The number of live, apoptotic and necrotic chondrocytes were counted. The patients are followed with Harris Hip score, Merle de Aubigne score and radiographs for two years.

Results: 7 patients were admitted directly to our hospital, the rest transferred from other hospitals. 18 patients had their hip reduced after a mean time of 276 minutes. 2 had femoral traction applied and 3 patients were not reduced. Mean time from trauma to operation was 6 ± 3.8 days. Three patients received total hip arthroplasty. The results of will be presented at the congress.

Conclusion: The conclusions will be given at the presentation.

References: Reference List (1) Hougaard K et al. Traumatic posterior dislocation of the hip(..) Arch Ort Trauma Surg 1986; 106(1):32-35. (2) Chen CT et al. Chondrocyte necrosis and apoptosis in impact damaged articular cartilage. J Orthop Res 2001; 19(4):703-711. (3) Chen CT et al. Time, stress, and location dependent chondrocyte death and collagen damage (..) J Orthop Res 2003; 21(5):888-898. (4) Costouros JG et al. Comparison of chondrocyte apoptosis in vivo and in vitro (..) J Orthop Res 2004; 22(3):678-683. (5) Hashimoto S et al. Linkage of chondrocyte apoptosis and cartilage degradation(..) Art Rheum 1998; 41(9):1632-1638. (6) Olson SA et al. From articular fracture to posttraumatic arthritis (..) JOT 2006; 20(10):661-662.

Disclosure: No significant relationships.

T108 Residents Laboratory Testing of Electromagnetic Navigation with the Use of Micro Sensors for Free-Hand Interlocking TechniqueM. Tomazevic¹, A. Fischinger¹, U. Tominc¹, A. Kristan², M. Cimerman³, D. Kreuh⁴¹Department of Traumatology, University Medical Centre Ljubljana, Ljubljana, Slovenia,²Dpt. of Traumatology, UMC Ljubljana, Ljubljana, Slovenia,³Traumatology, University Clinical Centre Ljubljana, Ljubljana, Slovenia,⁴Ekliptik L.t.d, Researcher, University Medical Centre Ljubljana, Ljubljana, Slovenia

Introduction: Distal inter-locking using free-hand technique in intramedullary nailing is always a time consuming procedure. The use of X-ray amplifier is mandatory and the exposure to radiation is rarely modest. If we use navigation devices we rarely trust the device completely and that is why we check the position with X-ray amplifier more than we need to. That is why we did laboratory testing of the new system using the electromagnetic navigation with the use of micro sensors for free-hand interlocking technique in laboratory without the use of X-ray amplifier to ensure the use of system in the operating theatre.

Material and Methods: Three residents with little experience in distal interlocking and no experience with this device were testing the electromagnetic navigation system with the use of micro sensors for free-hand interlocking technique. 100 interlocking holes were drilled by the use of Guiding star platform in Lidis module, Ekliptik, Slovenia. The system producer had 20 minutes of introduction time, afterwards drilling was done. Distal locking was done on UTN Synthes nail and instead of bone, cannulated hard wood rods were used. We measured time needed for calibration and time needed forreaming and weather we were successful or not.

Results: Drilling of distal locking holes was successful in 100%. The time needed for calibration was 98,2 seconds in 50 consecutive procedures, the average time for drilling an interlocking hole was 89,8 seconds in 100 consecutive procedures. To drill the first hole took 101 seconds on average and it took 81,4 seconds to drill the second hole. The learning curve was seen with all three residents.

Conclusion: Electromagnetic navigation with the use of micro sensors proved to be a safe, fast and reliable technique for free-hand interlocking and is now being used in real life surgery with success and confidence.

References: 1) Chu W, Wang J, Young ST, Chu WC. Reducing radiation exposure in intra-medullary nailing procedures: intra-medullary endo-transilluminating (iMET). Injury. 2009 Oct;40(10):1084-7.

2) Whatling GM, Nokes LD. Literature review of current techniques for the insertion of distal screws into intramedullary locking nails. Injury. 2006 Feb;37(2):109-19.

3) Lee MY, Kuo CH, Hung SS. A new fluoroscopy-free navigation device for distal interlocking screw placement. J Med Eng Technol. 2008 Jul-Aug;32(4):284-95.

Disclosure: No significant relationships.

VASCULAR LESIONS

PS001 Blind Subxiphoid Pericardiotomy for Cardiac Tamponade Secondary to Acute Hemopericardium – A Final Report

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Introduction: Percutaneous catheter drainage (PCD) is a useful method to manage pericardial effusion. However, PCD is not always effective in a case of hemopericardium due to clot. To perform subxiphoid pericardiotomy within a minute for emergency cases, we have done this procedure in a blind method following finger dissection by subxiphoid approach, which was preliminary reported in 2005. We present the final data to report the usefulness of blind subxiphoid pericardiotomy (BSP) for emergency cases with acute hemopericardium.

Material and Methods: We designed a study to determine a favorable management for cardiac tamponade due to hemopericardium. Emergency 148 patients with acute hemopericardium secondary to trauma (n=12), acute aortic disease (n=122) and cardiac rupture following acute myocardial infarction (n=14), were the subjects. Board certified surgeons performed BSP (n=16) and other emergency physicians performed PCD (n=67) for patients with cardiopulmonary arrest (CPA) or near CPA due to cardiac tamponade from 2000 to 2004. Since 2005, BSP (n=37) or PCD (n=28) has been performed at the physicians' discretion.

Results: BSP was effective to relieve cardiac tamponade in all 53 cases but PCD was ineffective in 12 cases (12.6%, p=.008) because of clot in pericardium (n=10) or right ventricular puncture (n=2). In addition to ineffective drainage, acute occlusion of percutaneous drainage tube (n=4) were observed and resulted in 2 deaths in the PCD group. Procedure-related complication rates of BSP and PCD and survival rates of BSP and PCD were 0% and 16.8% (p=.001), 18.9% and 6.3%, respectively (p=.018). Sixteen patients (BSP, 10; PCD, 6) could discharge following emergency surgery (n=13) or conservative treatment (n=3).

Conclusion: Blind subxiphoid pericardiotomy was safe and could be performed quickly in an emergency situation. Percutaneous catheter drainage for hemopericardium could not avoid critical complications because of clot in pericardium in some cases.

Disclosure: No significant relationships.

PS002 Variability in Clinical Presentation of Patients with Trauma to the Heart

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Introduction and Objectives: Heart trauma, mostly penetrating, is not common in our community, but carries a significant morbidity. Its clinical presentation can be variable. Our objective was to assess the

incidence, clinical presentation, associated injuries and mortality of our patient population with trauma to the heart.

Material and Methods: Observational, descriptive, retrospective analysis of patient with heart trauma included in our trauma registry between 1993 and 2007. We reviewed demographic characteristics, mechanism of injury, associated injuries, Injury Severity Score (ISS) and New Injury Severity Score (NISS), mortality, TRISS probability of survival (Ps), and hospital length of stay.

Results: We found 17 (1.1%) patients with cardiac traumatism out of 1.575 patients included in our registry, 6 (35%) with associated injuries and 11 (65%) isolated; 13 (76.5%) were from penetrating trauma, and only 4 (23.5%) were from blunt trauma. Mean ISS and NISS were of 28 (+/-12) and 35 (+/-14), respectively. Three patients presented "in extremis" (agonal status), nine presented with hemodynamic "stability" (SBP> 90 mmHg) (33% of them with a HR> 120 bpm), and five patients presented with hemodynamic instability. Only 30 % of the patients presented with cardiac tamponade, without hemothorax. Two pericardiocentesis (12%), 3 pericardial windows (18%), and 4 emergency room thoracotomies were done (23.5%). The most frequent location was in the left ventricle, followed by right atrium and right ventricle. The most frequent associated injuries were in the lungs (53 %), followed by the abdomen and vascular injuries (44.4 %). Fifty-nine percent required ICU admission, with a median length of stay of 25 days. Ten patients died (59%), and three of them (17.6%) were dead on arrival. Two patients (22.2%) died with a Ps > 0.50.

Conclusion: Heart trauma is not frequent in our community, and displays great variability in its clinical presentation, with a high mortality. Over half of the patients presented with hemodynamic "stability".

Disclosure: No significant relationships.

PS003 Combined Endovascular and Surgical Approach of Two Cases of Secondary Aorto-esophageal Fistula

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Introduction: An aorto-esophageal fistula is a rare cause of upper massive gastrointestinal bleeding, related to different etiology (aneurysm of the thoracic aorta, foreign body ingestion, oesophageal malignancy, traumatic pseudoaneurysm), resulting in high mortality rate.

Material and Methods: Since March 2008 to March 2009 we observed two cases of aorto-esophageal fistula causing a massive digestive bleeding.

Results: The 1st patient was a 57-y-old man in which fistula was secondary to a fish-bone ingestion, 10 days before the admission. In the 2nd case, a 66-y-old man, fistula was secondary to rupture in oesophagus of a known thoracic aortic aneurysm. Diagnosis was made by a contrast-enhanced CT scan; a gastrografin X-ray in the 1st and an endoscopy in the 2nd case completed the examination. In both cases the lesion consisted of a few-mm-diameter defect of the oesophageal wall. In the I case an emergent endovascular repair of thoracic aorta by Bolton Relay 28x110 mm stent graft was per-

formed; in the II case, endovascular repair of thoracic aorta (by Bolton Relay 28x145 mm) was associated to an endoprosthesis placement for primary treatment of a preexisting infrarenal abdominal aortic aneurysm. Postoperatively TPN was administered. Definitive treatment of fistula was performed in both cases by an explorative right thoracotomy (in V and VII post-operative day respectively): oesophagus was primarily repaired and reinforced by a pedicled intercostal muscle flap and a nutritional jejunostomy was associated. Subsequent post-operative course consisted in NE administration, prolonged nasogastric suction, resuscitation with fluids, antibiotics. Hemorrhagic complications or infections were excluded by repeated CT scan. Oral feeding was in 19th and 7th postoperative day, after exclusion of a persistent fistula at a gastrografin X-ray of oesophagus. Hospital stay was of 30 days in both cases. No late complications were registered at follow-up.

Conclusion: When an aorto-esophageal fistula occurs (if consists of a small oesophageal lesion), emergent treatment of endovascular aortic repair can be successfully associated to a second-step primary repair using a pedicled intercostal muscle flap via a right thoracotomy.

References: da Silva ES, Tozzi FL, Otochi JP, de Tolosa EM, Neves CR, Fortes F. Aorto-esophageal fistula caused by aneurysm of the thoracic aorta: successful surgical treatment, case report, and literature review. *J Vasc Surg.* 1999 Dec;30(6):1150-7. Assink J, Vierhout BP, Snellen JP, Benner PM, Paul MA, Cuesta MA, Wisselink W. Emergency endovascular repair of an aorto-esophageal fistula caused by a foreign body. *J Endovasc Ther.* 2005 Feb;12(1):129-33.

Disclosure: No significant relationships.

PS004 Endovascular Repair of Traumatic Thoracic Aortic Injuries

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Introduction: Thoracic aortic traumatism is associated to a high risk of morbidity and mortality. Endovascular treatment avoids open surgery risks and seems to have good functional results.

Material and Methods: We present 4 patients with thoracic aortic injuries who were managed with endovascular repair during the last 8 years.

Results: Case 1: A 51-year-old male is taken to our hospital after a car crash. On CT scan there was a periaortic hematoma from isthmus to diaphragm, multiple rib (flail chest) fractures, and a pelvic fracture. The aorta was repaired with an endograft with good immediate results. Case 2: A 55-year-old male, injured in a frontal car crash. On CT scan a mediastinal periaortic hematoma was seen, with a pseudoaneurysm at the origin of the descending thoracic aorta, distal to the subclavian artery. The aorta was repaired with an endograft, which was replaced at day 16th because of a leak. On follow-up he is doing very well. Case 3: A 26-year-old male, injured in a car crash. CT scan findings were as follows: a left diaphragmatic herniation, bilateral lung contusion, traumatic laceration of the descending aorta, pelvic fracture and spleen laceration. He

underwent an emergency laparotomy with splenectomy and diaphragmatic repair. On the 2nd postop. day an endograft was placed at the descending thoracic aorta, without complications. Case 4: A 68-year-old male, injured in a frontal car crash. On CT scan there was a thoracic aortic laceration, distal to the isthmus, and an aortic endovascular repair was undertaken at day 10th, after complete hemodynamic normalization. The patient died at day 58th from multiple organ failure.

Conclusion: Traumatic thoracic aortic injuries are frequently associated to severe thoracic, abdominal and orthopaedic injuries. Traditional early surgical aortic repair through thoracotomy, with single lung ventilation and, occasionally, extracorporeal circulation carries a high morbidity and mortality. That is the reason why aortic repair has classically been delayed, but this carries an additional mortality rate of between 6% and 9%. Endovascular treatment allows for an early management in severely traumatized patients who otherwise wouldn't stand such a risky surgery. It has also revealed lower rates of paraplegia after 10 years of follow-up.

References: Feezor RJ, Hess PJ Jr, Martin TD, Klodell CT, Beaver TM, Lottenberg L, Martin LC, Lee WA. Endovascular treatment of traumatic thoracic aortic injuries. *J Am Coll Surg.* 2009;208:510-6. Fattori R, Russo V, Lovato L, Di Bartolomeo R. Optimal management of traumatic aortic injury. *Eur J Vasc Endovasc Surg.* 2009;37:8-14. Xenos ES, Minion DJ, Davenport DL, Hamdallah O, Abedi NN, Sorial EE, Endean ED. Endovascular versus open repair for descending thoracic aortic rupture: institutional experience and meta-analysis. *Eur J Cardiothorac Surg.* 2009;35:282-6.

Disclosure: We all are surgeons at Gregorio Marañón Hospital, Madrid. Dr. Turegano is the chief of the Emergency Surgery department.

PS005 Allograft Repair for Traumatic Carotid-Jugular Arterio-Veinous Fistula After a Rocket Explosion in Afghanistan

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Introduction: Injuries in zone I of the neck are rare and difficult to manage particularly in environment of war. This area gathers aerodigestive, vascular, lymphatic and nervous elements. All the difficulties lie in diagnosis of the lesions, in the decision of a surgical exploration and in the way of repair if necessary. In that situation, fistula between carotid artery and jugular vein is very uncommon, accounting for 4% of all arterial injuries. Through one case, which has occurred in Afghanistan, we discuss the various possible solutions to repair such a lesion.

Material and Methods: We report one case of a french soldier, 30 yo, who was wounded by a rocket splinter on left side of the area I of the

neck. He was transported immediately in French Role II in Kaboul. Respiratory tracks are not injured, there's no neurologic lesions. He had a huge haematoma of the area with a tracheal back pushing (X-ray exam). During an effort of cough, a haemorrhage through the wound occurred requiring an oro-tracheal intubation and a surgical exploration by a cervicotomy. No obvious vascular lesions were found but just a thrill at the base of the neck. The patient was hemodynamically stable.

He was transferred by medevac to France in the night.

An angioscanner showed a fistula between carotid and jugular vein (2 photos).

Results: He was re-operated 24h after. The fistula was just behind the first rib requiring an enlarging by sternotomy to control the origine of left carotid. There was a section of left pneumogastric nerve. After exclusion of the fistula and the vein, we interposed an allograft on carotid artery (3 photos).

The patient discharged from the hospital one week later without lateral damage except a bitonal voice with no need of re-education.

Conclusion: Arterio-venous fistula is an uncommon consequence of carotid injury. The taking in charge of this patient and the decision of the kinds of repair are difficult. Stenting has also been used to repair distal internal carotid injuries that are not easily approached surgically.

The favorable outcome of this case illustrates that surgery is a reasonable alternative when an endovascular approach is not feasible in patients with trauma-acquired arteriovenous fistulae. Allograft or vein graft, if possible, is also a good solution for this kind of injuries.

References: 1-Nandapalan and al, J Laryngol Otol 1995;109:562-4

2-Robbs and al, Br J Surg 1994;81:1296-9

3. Chen and al, J Formos Med Assoc 2006;105:844-7

4. Amirjamshidi and al, Surg Neurol 2000;53:136-46

5. Szopinski and al, Eur J Vasc Endovasc Surg 2005;29:256-61

6. Droll and al, J Clin Anesth 2004;16:127-9

7. du Toit and al. Eur J Vasc Endovasc Surg 2009;38:267-72

8. Vertrees and al, J Trauma. 2009;66:980-3

Disclosure: No significant relationships.

PS006 3 Cases of Subclavian Artery Injury Caused by Traffic Accidents

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Introduction: We report 3 cases of subclavian artery injury caused by traffic accidents. In all cases, surgical vascular reconstruction was undertaken. In 2 of the cases, the subclavian artery was obstructed by intimal dissection caused by falling down from a motorcycle. In the remaining case, subclavian artery aneurysm caused by seat belt injury occurred.

Material and Methods: Case 1: 59-year-old male While driving a large motorcycle, the patient collided with a car and the left side of his body was trapped in the car. This resulted in traumatic pneumothorax and severe ischemia of his left upper limb, and he was

transported to our Level 1 trauma center for surgical treatment. Bypass surgery using a 6mm diameter PTFE was performed. Postoperative arteriography showed good patency of the graft and the patient was discharged. Recovery from the motor dysfunction caused by brachial plexus injury took 7 months. Case 2: 19-year-old male For this case, the patient ran into a wall while driving a 50 cc motorcycle. Bypass surgery and clavicular ORIF were undertaken simultaneously for right clavicular fracture and ischemia of the right upper limb. Postoperative arteriography showed good patency of the graft and the ischemia improved. However, rehabilitation was needed for the motor dysfunction caused by brachial plexus injury. Case 3: 68-year-old female The patient ran into a tree while driving a car resulting in hemorrhagic shock caused by bilateral femoral and humeral fractures. She was transported to our center by helicopter. A scar from seat belt injury was found in the right cervical area. She presented with an expanding mass around the subclavian artery with accompanying pulsating pain. Arteriography detected a 5 cm-diameter pseudoaneurysm and aneurysmectomy was undertaken. Postoperative computed tomography confirmed the disappearance of aneurysm and she was discharged.

Results: These 3 cases showed favorable outcomes with surgical vascular reconstruction.

Conclusion: Traumatic subclavian artery stenosis is caused by crush-induced local dissection and is frequently complicated with brachial plexus injury. Subclavian artery aneurysm caused by seat belt injury occurred.

Disclosure: No significant relationships.

PS007 Trap-Door Incision for Penetrating Thoracic Trauma: An Obsolete Approach?

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Introduction: "Trap-door" incisions have lately been dismissed as too mutilating for the occasional victim of a penetrating thoracic trauma with massive bleeding difficult to expose.

Material and Methods: To present a case of severe bleeding from a stab wound in the left subclavicular area in a heavy-built patient who was brought to our ED. A "trap-door" incision proved inevitable to expose and repair the injury, and probably saved his life.

Results: Case description: 40 years old male patient who was brought in after receiving a large stab wound below the mid-portion of the left clavicle. Severe external bleeding was prevented by manual compression in transit to the hospital. Three Foley catheters introduced through the wound at the ED failed to temporarily control the bleeding due to its large size, and he was rushed to the OR. An emergency left antero-lateral thoracotomy allowed for the blind manual compression of the bleeding vessel from within the thoracic cavity, and was very successful in stopping the external bleeding. A long supra- and infra-clavicular incision was done, and the clavicle was divided. This failed to expose the bleeding vessel, due to the large muscle mass of the patient. A decision was taken to split the

sternum in a “trap-door” approach, which nicely exposed a large laceration of the subclavian vein. This was suture-ligated, and the incision closed, in a surgical field with profused oozing from coagulopathy. He was taken to the ICU, and then back to the OR two hours later because of persistent bleeding through the chest drains. The “trap-door” incision was reopened and careful haemostasis was performed. The patient had a protracted course in the ICU but eventually recovered. As a striking and very uncommon sequel he developed severe blindness from bilateral ischemic optic neuropathy attributed to hypotension and use of vasopressors. He is free of pain at the incision and with good cosmetic results

Conclusion: “Trap-door” incisions are very infrequently used nowadays, but should be kept in mind in the armamentarium of trauma surgeons.

Disclosure: No significant relationships.

PS008 Clinicopathological Patterns of Inferior Vena Cava Injuries: A Retrospective Analysis of 194 Cases

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Introduction: Inferior vena cava (IVC) injuries account for 30-40% of abdominal vascular injuries. Despite advances in trauma and intensive care, patients with IVC injuries continue to have a mortality rate of 40-66 %. The purpose of this study is to evaluate the ability of clinicopathological patterns to predict mortality of patients with IVC injuries.

Material and Methods: Records of patients undergoing surgery for IVC injuries between 1992-2007 at the University of Miami Ryder Level-1 Trauma Center were reviewed. Patients were divided into three groups according to vital signs upon arrival and intraoperative findings. Vital sign groups included hemodynamically stable patients (Group 1), unstable patients (heart rate >110, systolic blood pressure <90 – Group 2) and on extremis (Group 3). Intraoperative findings groups included confined retroperitoneal hematomas (Group A), expanding hematomas (Group B), and ruptured retroperitoneal hematomas and active intra-peritoneal bleeding (Group C).

Results: The study included 194 patients. Mortality rate was 49.4%. Analysis of variables on admission showed that non-survivors were significantly more hypotensive (SBP of 40±12 mmHg versus 98±8 mmHg; p<0.001), had higher ISS (39±5.8 versus 17±3.6; p<0.001), decreased GCS (6.6±2.7 versus 14.4±0.6; p<0.001), and a greater base deficit (15.8±4.5 versus 6.3±2.5; p<0.001). Vital sign groups included 90 patients in Group 1, 42 in Group 2 and 62 in Group 3. Mortality rate was 16.6%, 50%, and 95%, respectively. Intraoperative findings groups included 85 patients in Group A, 48 in Group B and 61 in Group C. Mortality rate was 15%, 47.9%, and 93%, respectively.

Conclusion: Mortality in patients with IVC injuries can be well predicted by hemodynamic parameters on arrival and intra-operative findings. Hemodynamic instability and intraoperative findings of expanding hematomas and active intra-peritoneal bleeding are associated with high mortality.

References: 1. Jackson MR, Olson DW, Beckett WC Jr, et al. Abdominal vascular trauma: A review of 106 injuries. *Am Surg* 1992; 58: 622-626. 2. Coimbra R, Prado PA, Araujo LHB, et al. Factors related to mortality in inferior vena cava injuries: A 5 year experience. *Int Surg* 1994; 79: 138-141. 3. Leppaniemi AK, Savolainen HO, Salo JA. Traumatic inferior vena cava injuries. *Scand J Thorac Cardiovasc Surg* 1994; 28: 103-108. 4. Buckman RF, Pathak AS, Badellino MM, et al. Injuries of the inferior vena cava. *Surg Clin North Am* 2001;81: 1431-1447. 5. Rosengart FW, Smith DR, Melton SM, et al. Prognostic factors in patients with inferior vena cava injuries. *Am Surg* 1999; 65: 849-855. 6. Kuehne J, Frankhouse J, Modrall G, et al. Determinants of survival after inferior vena cava trauma. *Am Surg* 1999; 65: 976-981. 7. Hansen CJ, Bernardas C, West MA, et al. Abdominal vena cava injuries: Outcomes remain dismal. *Surgery* 2000; 128: 572-578. 8. Burch JM, Feliciano DV, Mattox KL. The atriocaval shunt. Facts and fiction. *Ann Surg* 1998; 207:555-568. 9. Klein SR, Baumgartner FJ, Bongard FS. Contemporary management strategy for major inferior vena cava injuries. *J Trauma* 1994; 37:35-41

Disclosure: We certify that all our affiliations with or financial involvement (employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending) with any organization or entity with a financial interest.

PS009 Infected Postraumatic External Iliac Artery Pseudoaneurysm – Multimodal Approach

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Introduction: Vascular complications due to intravenous drug abuse pose significant challenges to vascular surgeons and no standardized surgical management of the resultant infected pseudoaneurysm was established.

Material and Methods: We present our successful management of a case of an expanding retroperitoneal haemathoma due to external iliac artery pseudoaneurysm caused by self inflicted trauma (heroin administration). MRI showed an external iliac artery pseudoaneurysm surrounding by an infected old haemathoma, venous thrombosis (external iliac and femoral) and multiple muscular abscesses of the left thigh. A self-expandable stent-graft was deployed across the pseudoaneurysm after crossing the lesion with an exchange glide wire through the left brachial artery route. Post-stenting angiography showed complete exclusion of the pseudoaneurysm with no residual stenosis. We decided local surgical debridement; after haemathoma evacuation we identified external iliac artery presenting a stent graft and reinforced it by double layer of tissue sealing surgical patch.

Results: Postoperative course was favorable under complex general and local therapy.

Conclusion: Endovascular treatment of arterial pseudoaneurysms has become feasible as natural extension of the endovascular techniques. CT, MRI, sonography and angiography may all be valuable in the imaging working of pseudoaneurysms. Prompt diagnosis and treatment are necessary to avoid the morbidity and mortality secondary to hemorrhage and rupture. Although endovascular stent-grafting is not considered a standard therapy for infected aneurysms, our case suggest that stent-graft deployment, secondary surgical debridement and major antimicrobial therapy may be the most favorable treatment option for patients unfit for major surgery.

References: Hybrid repair of ruptured infected anastomotic femoral pseudoaneurysms: Emergent stent-graft implantation and secondary surgical debridement. - Klonaris C, Katsargyris A, Vasileiou I, Markatis F, Liapis CD, Bastounis E.; *J Vasc Surg.* 2009 Apr;49(4):938-45. Epub 2009 Jan 14. Emergency stent grafting after unsuccessful surgical repair of a mycotic common femoral artery pseudoaneurysm in a drug abuser - Lupattelli T, Garaci FG, Basile A, Minnella DP, Casini A, Clerissi J.; *Cardiovasc Intervent Radiol.* 2009 Mar;32(2):347-51. Epub 2008 Oct 18. Endovascular stent-grafting for infected iliac artery pseudoaneurysms. - Sanada J, Matsui O, Arakawa F, Tawara M, Endo T, Ito H, Ushijima S, Endo M, Ikeda M, Miyazu K.; *Cardiovasc Intervent Radiol.* 2005 Jan-Feb;28(1):83-6

Disclosure: No significant relationships.

PS010 Interventional Radiology in the Management of Vascular Trauma

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Introduction: The incidence of traumatic vascular injuries (TVI) has increased significantly in the last decades, with penetrating trauma as the most frequent mechanism. Our aim was to estimate the incidence, management by interventional radiology, and the preventable death rate in our patient population.

Material and Methods: A retrospective observational study based on our Trauma Registry covering a 14-year period (July 1993 to July 2007). We have assessed the demographics, severity, diagnostic and therapeutic approaches, outcome, and TRISS probability of survival (Ps).

Results: 76 patients (80% males, with a mean age of 37 years) suffered a TVI located at the head (2), neck (7), thorax (20), abdomen (4), upper extremities (19) and lower extremities (24), respectively. 39 (51.3%) were caused by a blunt mechanism, and 37 (48.7%) by an open one. The average time spent before being taken to hospital was 60 minutes. Upon arrival to hospital, 20 were in shock, 22 required orotracheal intubation, and 2 a cardiac massage. The diagnostic methods used were a CT scans in 54, DPL in 1, FAST in 7, angiography in 16, echocardiogram in 4 and duplex-doppler in 1. 69 (90.8%) patients underwent emergency surgery and 8 (10.5%) were treated with interventional radiology (7 of them associated with surgery). Only 6 (7.9%) were treated conservatively. Overall mortality was of 12 patients (15.8%) (6 of them died upon their arrival to hospital or

in the operating room, all of them with an aortic injury), out of which 5 (6.6%) had a TRISS Ps > 0.5. The incidence of TVI increased from 15 cases in the 1993-1997 period to 30 in 1998-2002, remaining stable in 2003-2007 (31). However, the mortality rate has shown a steady decline over the years (from 33% in 1993-1997, to 16% in 2003-2007).

Conclusion: The incidence of traumatic vascular injuries has increased considerably during the last years in our hospital. These injuries are most commonly located in the lower extremities, followed by the thorax. 10% of patients could be managed by interventional radiology techniques.

Disclosure: No significant relationships.

PS011 Reperfusion Syndrome Following Crushing Trauma with Acute Lower Limb Ischaemia

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Introduction: Complex limb trauma, with both bone and soft tissue injuries, are more and more frequent since high energy trauma agents are responsible for them. Vascular injuries are usually associated with these trauma, the most severe being represented by Acute Peripheral Ischaemia (API) which needs surgery in order to preserve the vitality of the injured limb. Reperfusion Syndrome following surgery can affect both local and general prognosis of the patient (in the most severe cases, by MSOF) and demands sustained treatment in order to preserve the life of the patient.

Material and Methods: The authors present 6 cases of Reperfusion Syndrome (following ischaemia of the inferior limb), treated in the Emergency Hospital, Bucharest, between 01.06.2005- 01.06.2008. The patients are analysed concerning: - the bone and arterial injury - the moment of surgical repair of the artery, -post-operative treatment, -the clinical aspect and the treatment of the reperfusion syndrome.

Results: Unfortunately, 2 of the patients died, 2 developed acute renal failure and 1 chronic renal failure after reperfusion. The reperfusion syndrome was associated, in these cases, with late surgical arterial repair and with incomplete fasciotomy. Complex treatment was necessary in all these cases for the systemic consequences of reperfusion.

Conclusion: Early surgical restoration of the artery, correct fasciotomy and complete systemic sustaining treatment are absolutely necessary in order to avoid Reperfusion Syndrome. Once developed, this is a threatening- life disorder and needs a huge amount of therapeutical means in order to maintain the patient alive.

References: 1. Blaisdell, F.W. The Pathophysiology of Skeletal Muscle Ischemia and the Reperfusion Syndrome: A Review.

Cardiovascular Surgery Vol 10. Pg 620-630 2002 2. Lethal potential of reperfusion Syndrome-O. Lupescu, A. Sirbu, M. Nagea, D. Sirbu
Rom J Leg Med 16(2)134-140(2008)

Disclosure: No significant relationships.

LOWER EXTREMITY

PS012 How Does the Tip-Apex Distance Measure Up?

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Introduction: The tip apex distance (TAD) is a simple measurement that predicts screw cut out in the femoral head in peritrochanteric fractures treated with a fixed angle sliding hip screw device. We wanted to assess whether the TAD measurements in our centre were comparable to previously published results, how reproducible these measurements were between observers and how accurate we were at reducing the fractures.

Material and Methods: A retrospective review was conducted of 102 consecutively treated peritrochanteric fractures over a 12 month period. 11 patients were excluded because they did not sustain a peritrochanteric fracture, had treatment of a pathological fracture or because of incomplete radiographic data. Three observers used a standardised method to measure the TAD (from 2 orthogonal projections with a correction for magnification). The stability of the fracture patterns and the accuracy of reduction were measured according to criteria from the original Baumgaertner paper¹.

Results: 91 fractures were sustained in 90 patients, with one patient being treated for bilateral hip fractures. The male to female ratio was 33:57. The mean age of the patients at the time of treatment was 80 years (range 18 to 101). Four different implants were used during the study period: 63 Dynamic Hip Screws (DHS), 26 Gamma Nails (GN), 1 Proximal Femoral Nail (PFN) and 1 Intramedullary Hip Screw (IMHS). Ten fractures (11%) were classified as unstable according to OTA/AO classification and 88 (96.7%) had a good or acceptable reduction in theatre. The mean tip apex distance was 19.23 mm (95% CI: 17.98 to 20.49). There was 1 screw cut out through the femoral head during the data collection period in a patient with an unstable fracture. Assessing the inter-observer variability, the standard deviation between the 3 observers was 1.99mm, equivalent to 10% of the mean TAD. Six patients (6.6%) had a TAD greater than 30mm, predictive of a much higher extrusion rate.

Conclusion: Our results compare favourably to those seen in original paper and we have found a similar level of inter-observer variability in terms of a standard deviation of 10%. Measurement of the TAD retrospectively can provide a useful method to reliably audit our results for quality control purposes and identify whether patients have fixation at higher risk of cut out.

References: 1. Baumgaertner M, Curtin S, Lindskog D and Keggi J. The value of the tip apex distance in predicting failure of fixation of

peritrochanteric fractures of the hip. J Bone J Sur, 77-A: 1058-1064, 1995.

Disclosure: No significant relationships.

PS012 Miss-Target of Distal Screw Insertion Using a Targeting Device in Short Gamma3 Nailing

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Introduction: Distal locking screw insertion of the short Gamma 3 nail is normally performed by using a targeting device attached firmly to the proximal part of the nail. Generally, the accuracy of targeting device should be promising. However, missing the target in the process of drilling might be a potential risk. We report 5 cases of such condition in term of early radiographic finding, method of solving and the result of treatment.

Material and Methods: The patient records, operative notes and intraoperative c-arm images of the patients underwent short Gamma 3 nailing for unstable peritrochanteric fractures during October 2008 to October 2009 have been reviewed in order to identify an error of distal locking screw insertion via a targeting device. The intraoperative radiographic finding, solving procedure and the outcome has been analyzed.

Results: There were 64 cases of short Gamma 3 nailing over the past one year in our institute. Five of which had an error during distal screw insertion even using the targeting device. An error occurred in the drilling process in all cases. Intraoperative images showed that the drillbit missed its target posteriorly after perforating the near cortex of the femur. All has been corrected by using a free-hand technique under c-arm guidance. No any serious complication afterword and all fractures healed in an appropriated time.

Conclusion: Distal screw insertion during Gamma 3 nailing can be missed even though using the targeting device. Therefore, radiographic confirmation on the lateral view after perforation the near cortex is recommend in all cases in order to obtain early detection prior to bicortical perforation. Freehand technique can be carried out in order to correct the error.

References: Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults. Parker MJ, Handoll HH. Cochrane Database Syst Rev. 2008 Jul 16;(3):CD000093.

Disclosure: No significant relationships.

PS014 Is Stability a Determinant Factor in Medial Femour Neck Fracture Healing Independent from Blood Supply

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Introduction: Clinical Problem: The hypothesis of these studies is that the instability of fracture fixation which allows micro movements is an important factor in the high failure rate of medial femur neck fractures independent from osteoporosis, disturbed blood supply and high biomechanical load.

Material and Methods: from 1982-1992 85 patients with medial femur neck fractures were treated with 3 to 4 screw fixation and 46 with a 130° plate from whom 65 could be re-examined retrospectively up to 10 years after operation. In a second group 134 patients treated from 1999 to 2004 with the Gliding nail (GN) which is a intramedullary implant with a gliding femur neck component with a rotation stable I beam profile plate which is impacted and not inserted after bone removal as in screw systems (local bone graft effect).

Results: The late complication rate in the screw group was 32,5% and in the 130° plate 52%. In 34% a hip prosthesis was implanted after complications occurred.

In the GN treated patients only in 10,4% secondary prosthesis had to be implanted.

Surprisingly there was nearly no difference between the rate of failure and secondary hip replacement in Pauwels I to III fractures.

Conclusion: stability is a major factor in healing of fractures with disruption of blood circulation.

Disclosure: No significant relationships.

PS015 Refined Guidelines for Transfusion After Intramedullary Nailing of Hip Fractures

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Introduction: The Gamma 3 interlocking nail (Stryker, USA) is used in our centre for fixation of unstable intertrochanteric fractures through a limited incision to minimise blood loss. This subgroup of fractures has a more severe fracture pattern which can cause greater occult blood loss in addition to losses attributable to surgery. A comparison was made of the haemoglobin levels in the pre and post-operative period between those patients requiring a transfusion and those not, to determine if operative losses contributed more to overall blood loss.

Material and Methods: Retrospective consecutive review of patients undergoing Gamma Nail fixation. The pre-operative and post-operative haemoglobin was recorded and timing and volume of transfusion. Data was analysed using a repeated measures regression model with time category, transfusion (or not) and the time-transfusion interaction as factors in the model.

Results: Fifty one patients were identified (mean age of 78 years). 3 died during the study period for unrelated reasons. 23 patients received transfusions: 4 pre-operatively, 6 on the day of surgery and 14 within 48 hours post-op. 9 were transfused after 48 hours. The mean pre-op Hb in the non-transfused group was 11.8 g/dL which was higher than the transfused group, 9.6 g/dL ($p < 0.00$). In the early 48 hour post-operative period mean haemoglobins were comparable in both groups ($p=0.358$). At days 3-5 there was a higher mean Hb in the transfused group ($p=0.001$) due to the effect of transfusion.

Conclusion: There was a significant difference in the starting Hb level and patients in the transfusion group were anaemic before surgery. The fall in Hb however was greater in the non-transfused group. Early transfusion of patients with pre-op anaemia may help avoid haemodynamic compromise and its consequences.

Disclosure: No significant relationships.

PS016 Treatment of Femoral Fractures Around a Trochanteric Nail

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Introduction: The treatment of intertrochanteric fractures with trochanteric nails is very common. The presence of these implants increases the risk of a later femoral fracture in susceptible osteoporotic patients. These patients have a high likelihood of suffering a further drop. In these cases, the femur fracture is usually through or distal to the tip of the trochanteric nail. The treatment of this new fracture is a challenge for the orthopaedic surgeon. The aim of this paper is to describe our experience in the treatment of these fractures.

Material and Methods: Retrospective study of a case series. Inclusion criteria: 1) having had a fracture treated with a trochanteric nail, 2) fracture through or distal to the tip of the nail caused by a new fall during the period 2003 to 2008 in our hospital. 11 patients met these criteria. 2 patients were treated with retrograde femoral nail, 3 by LISS plate, and 6 with long trochanteric nail. We measured demographic data, surgical time, blood loss and time since the original hip fracture. The evaluation methodology was the presence or absence of fracture healing, mortality, medical complications and ambulatory category at hospital discharge.

Results: The results were as follows: 2 failures of osteosynthesis, one LISS plate and one with long trochanteric nail, with delayed fracture healing. 1 case of in-hospital mortality.

Conclusion: The prevalence of fractures around a trochanteric nail is very low. The results in the treatment depend on the stability of the osteosynthesis obtained. We think it is not justified the systematic use of long nails for the treatment of intertrochanteric fractures.

References: Robinson CM, Adams CI, Craig M, et al. Implant-related fractures of the femur following hip fracture surgery. *J Bone Joint Surg. Am.* 2002;84:1116-22. Lorich DG, Geller DS, Nielson JH. Osteoporotic Pertrochanteric Hip Fractures. Management and Current Controversies. *J Bone Joint Surg. Am.* 2004;86:398-410. Simmermacher RKJ, Ljungqvist J, Bail H, Hockertz T, Vohteloo AJH, Ochs U, Werken Ch. The new proximal femoral nail antirotation (PFNA) in daily practice: Results of a multicentre clinical study. *Injury.* 2008;39:932-9. Haidukewych GJ. Intertrochanteric fractures: ten tips to improve results. *J Bone Joint Surg. Am.* 2009;91:712-9.

Disclosure: No significant relationships.

PS017 Lag of Uniformity in the Treatment of Infected Hip Hemiarthroplasty

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Introduction: Surgical site infection (SSI) following hip hemiarthroplasty is a major complication and has a reported incidence from

1-7%. It results in prolonged hospital stay, increased financial costs, antibiotic use and morbidity or mortality. The treatment strategy of this complication is not clear and therefore we wanted to analyze the incidence of infected hemiarthroplasty in our institution and determine the differences in chosen treatment.

Material and Methods: Retrospective data of all patients (n=275) undergoing hip hemiarthroplasty after fracture between January 2004 and March 2009 were analyzed to determine infection rate, wound cultures, antibiotic treatment, surgical treatment and outcome.

Results: We found that 39 patients (14%) developed a SSI. Five patients (13%) had a preoperative stay of more than 2 days. Mean operation time was 74 minutes. Thirty-three patients (85%) had an early infection (< 30 days), in 6 patients (15%) a late infection occurred (> 30 days). Forty-one percent of the infections were superficial wound infections. Thirty-one percent was caused by a monoculture and 38% by a multiculture infection. *Staphylococcus aureus* was identified in 70% of SSI. In 15 patients (38%) the wound was opened at the surgical ward. In 24 cases (62%) the wound was explored in the OR, seventeen patients required a second exploration, 9 a third and the remaining 4 required multiple interventions. In 15 cases (38%) hemiarthroplasty removal was performed. Antibiotic beads were used in 17 patients (44%), and repeated in 8 patients (21%). Systemic antibiotics were used in 36 patients (92%). Ten different types of antibiotics were used after wound exploration for a period between 1 and 12 weeks. In-hospital mortality was 15%. Sixty-nine percent (n=27) was finally discharged from follow-up.

Conclusion: We conclude that our infection rate was higher than reported in literature and the infections classified initially as superficial required a prolonged treatment as well. Moreover, the treatment of this disastrous complication showed no uniformity whatsoever and should be the topic of further research, resulting in a clear protocol to increase survival and decrease morbidity.

References: Infection of the surgical site after arthroplasty of the hip, S. Ridgeway, J. Wilson, A. Charlet, G. Kafatos, A. Pearson, R. Coello, *J Bone Joint Surg [Br]* 2005;87-B:844-50. The management of peri-prosthetic infection in total joint arthroplasty, A. D. Toms, D. Davidson, B. A. Masri, C. P. Duncan, *J Bone Joint Surg [Br]* 2006;88-B:149-55. Evaluation of 238 consecutive patients with the extended data set of the Standardised Audit for Hip Fractures in Europe (SAHFE), Heikkinen T, Partanen J, Ristiniemi J, Jalovaara P, *Disabil Rehabil.* 2005 Sep 30-Oct 15;27(18-19):1107-15. Impact of deep infection after hip fracture surgery on function and mortality, J. Partanen et al, *Journal of Hospital Infection* (2006) 62, 44-49. Early infection after hip fracture surgery, C. Edwards, A. Counsell, C. Boulton, C. G. Moran, *J Bone Joint Surg [Br]* 2008;90-B:770-7. Deep wound sepsis following total hip arthroplasty, RH Fitzgerald, DR Nolan, DM Ilstrup, RE Van Scoy, JA, *J Bone Joint Surg Am.* 1977;59:847-855. Diagnosis of periprosthetic infection following total hip arthroplasty -evaluation of the diagnostic values of pre- and intraoperative parameters and the associated strategy to preoperatively select patients with a high probability of joint infection, Michael Müller, Lars Morawietz, Olaf Hasart, Patrick Strube, Carsten Perka, Stephan Tohtz, *Journal of Orthopaedic Surgery and Research* 2008, 3:31.

Disclosure: No significant relationships.

PS018 Treatment of Complex Femoral Non-Union with a First Generation Locked Wave Plate – Prospective Clinical Evaluation

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Introduction: The bone healing of the femur is notoriously difficult once a non-union has established. In 1990 Blatter and Weber presented the results of the treatment of femoral non-union with a wave plate with the title “Wave plate osteosynthesis as a salvage procedure” outlining this technique as a last resort before amputation or acceptance of non-union in difficult cases. In the late 1980s studies led to the development of a multidirectional locked wave plate based on the initial design by Weber. Its primary purpose was the treatment of femoral nonunion. The implant is now produced and commercialized by a medical manufacturer under the name “Pressure Plate Fixator” (PPF). We present the results of the treatment of 75 consecutive patients who were treated with this implant. Aim of the study is the analysis of the results of the treatment of aseptic femoral nonunions using a singular locked implant.

Material and Methods: Consecutive case series, setting is a level-1 trauma center with a high number of specialist referrals. Patients: The study is based on a consecutive series of patients with prospective data evaluation. From 1993 to 2003, 75 patients were treated with a wave plate. All patients had persistent non-union of the femoral shaft without clinical or laboratory signs of infection and previous unsuccessful attempts to treat the non-union. Methods: The method of treatment was standardized and included a lateral approach, cancellous bone hip grafting, osteosynthesis with a wave shaped plate (PPF) and poly-axial locking screws as well as the application of a Gentamicin-PMMA chain. Main outcome measurements were time to achieve union, rate of implant failure and number of remaining non-unions after treatment. 75 patients had full follow-up and were included in the study.

Results: The non-union healed in 64 patients (85.3%) after the initial procedure. In 8 cases a secondary bone graft was needed. The mean time to union was 7.3 months (3-19). The implant failed in 3 cases accounting for 4% of the total. In 25 cases there were signs of low grade infection: in 13 patients the histology showed signs of a chronic infection. In 12 cases the microbiology swab was positive. Full weight bearing was achieved at an average of 4.2 months (1 day to 12 months). During the follow-up all patients had gained full weight bearing. Eight patients were using a stick, three regularly and five patients only occasionally. Seven patients (9.4%) had to retire from work due to health reasons. Fifty-one patients were pain free. Twenty-one patients complained of pain when walking long distances or climbing stairs.

Conclusion: The locked wave plate offers a further reliable treatment for complex aseptic femoral non-unions. The bone healing is clearly positively influenced. There is a high rate of low grade infection detectable in femoral non-union.

Disclosure: No significant relationships.

PS019 Retrospective Evaluation of the Use of the Posterior Lip Augmentation Device for Recurrent Hip Dislocation in Patients with Previous Charnley Hip Arthroplasty

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Introduction: In patients who have recurrent hip instability following total hip arthroplasty (THA) with a Charnley prosthesis, the posterior lip augmentation device (PLAD) is a minimally invasive surgical treatment option. Minimal data exists regarding the long-term outcome after PLAD application and variable success rates reported. This study aimed to further evaluate the role of PLAD application for recurrent hip instability following THA and its long-term outcomes.

Material and Methods: Patients undergoing PLAD application at Fairfield General Hospital (Bury, UK) for hip instability after THA were identified using hospital records coding data. Radiological and clinical data were analysed retrospectively using the patient's hospital case-notes and electronic PACS system.

Results: Data was available for 15 PLAD applications in 15 patients with an average age of 75.1 years. The mean follow-up period was 21.9 months. PLAD application prevented further dislocation in 73% (11/15) of patients. Girdlestone procedure was performed in 2 patients who experienced further hip dislocation. Long-term follow-up of patients with PLAD remaining in-situ demonstrated that 100% of patients were independently mobile at 2-4 years postoperatively, and all patients were pain-free during long-term follow-up after 1-year. Sub-group analysis of risk factors identified only a significantly higher ASA grade to be associated with further episodes of dislocation in patients undergoing PLAD application.

Conclusion: Our study provides further evidence supporting the role of PLAD as a safe minimally-invasive procedure for elderly patients with recurrent hip instability after Charnley THA in whom prosthetic components are well-positioned and well-fixed. Our results demonstrate that the majority of patients undergoing PLAD application return to independent mobility with no long-term hip pain. PLAD application should be used with caution in patients with an ASA grade of 3 or greater

References: [1] Gholve PA, Lovell ME, Naqui SZ. Minimal Surgical Approach for Recurrent Hip Dislocation Using the Posterior Lip Augmentation Device for the Charnley Hip Arthroplasty. *The Journal of Arthroplasty*. 2006; 21 (6): 865-868. [2] McConway J, O'Brien S, Doran E, et al. The use of the posterior lip augmentation device for a revision of recurrent dislocation after primary cemented Charnley/Charnley Elite total hip replacement. *The Journal of Bone and Joint Surgery (Br)*. 2007; 89-B: 1581-1585.

Disclosure: No significant relationships.

PS020 Bearing Surfaces: Who Gets What Hip? A Literature Review

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Introduction: The hip is a ball-and-socket joint (bearing) and arthroplasty is one of the most common orthopaedic procedures. Majority of orthopaedic patients presenting in accident and emergency have fractured their hips; bearing in mind that the advent of technology and development has lead to an older population. The choice of material used in the 'bearing' affects the long term durability of the joint replacement and current results show approximately 95% implant survival after ten years that further 'technical development' will marginally improve the result measured. The choice of bearing used is still controversial and most interesting field of hip replacement.

Material and Methods: We carried out a literature review across United Kingdom, Australia and Sweden to determine choices of implants designs used. We looked at implant choices in terms of sizes, availability and durability of implants and fixation techniques based on gender and age. We studied in particular how to enhance durability and increase implant survival.

Results: Studies in Sweden showed that factors affecting the implant choices are limited by the variables available and recorded in databases with continued work on 'case-mix' variables being of greatest importance. The study divided the outcomes based on age intervals and all observations were reported by gender and causes of revision included. Women <50 years had a poorer result than men, however, when diagnosis and other contributory factors in a regression analysis were adjusted, the gender difference disappeared. The results improved using cemented fixation for both genders. A study in Australia revealed that differences in outcome were age related. In patients' ≥75 years, cementless fixation had over twice the risk of revision compared to cemented or hybrid fixation. In age group <55 years, there was no difference. In the United Kingdom, the choice of bearing surface is surgeon and implant design availability dependent.

Conclusion: Choices are dependent on the surgeon's training, colleague's preferences, trust policies and implant costs. Age and gender also affect the patient-related outcome however, none of the existing implants or methods of fixation has shown to be better in terms of implant survival. There still remains no consensus on implant choice and the burden still remains surgeon dependent.

References: 1.Murray DW;Carr AJ; Bulstrode CJ. *Journal of Bone & Joint Surgery- British Volume*, July 1995 2.Gomez PF, Morcuende JA (2005). Early aetiology at hip arthroplasty—1700-1950 3.Cowell CWJr;Hozack WJ;Mesko JW et al. *Clinical Orthopaedics & Related Research*, Dec 2007,vol.465 4.Milosev et al. *JBJS- American Volume*, June 2006 5.Schreurs BW; Busch VJ; Veth RP. *Nederlands Tijdschrift voor Geneeskunde*, Sep 2007,vol.151/32. 6.Swedish Hip Registry, Annual report 2006 7.Australian Hip Registry, Annual report 2008 8.National Joint Registry, Annual report 2005-2006

Disclosure: No significant relationships.

PS021 Current Practice in the Use of Femoral Nerve Blocks When Splinting Femoral Fractures

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Introduction: Missed compartment syndrome can have potentially devastating long-term impacts on individuals. In the reported literature ipsilateral femoral fracture has been present in 52-58% of acute

thigh compartment syndromes. Time to diagnosis of acute thigh compartment syndrome has been cited as a key determinant of subsequent functional outcome. The role of femoral nerve blocks in splinting of femoral fractures is somewhat controversial as it can be argued it may mask early compartment syndrome. We present the attitudes of emergency department (ED) and orthopaedic staff at acute NHS trusts in England with regard to this issue.

Material and Methods: Survey of all 171 acute hospitals in the United Kingdom accepting trauma admissions. On-call middle grade doctors in both the emergency and orthopaedic departments were contacted to complete a telephone survey into departmental protocol and their own experience of femoral nerve blocks for lower limb fractures.

Results: Middle grades from all 171 acute trusts completed the survey (100% response rate). 54 emergency departments (30.8%) reported having a protocol for the use of femoral nerve blocks. Middle grades in the ED reported using a nerve block routinely in 95 hospitals (54%) with 63 opting for a long-acting agent and 32 for short-acting. Of those that did not 70% (n=53) felt they were unnecessary, 21% (n=16) were not confident in using the technique and 9% (n=7) had worries over compartment syndrome. 116 out of 171 (68%) said they would be worried about compartment syndrome in high-energy injuries. Orthopaedic departmental protocols for nerve block use were reported in 16 trusts (9%). 45 orthopaedic middle grades (26%) indicated that they would use them routinely with 17 using long-acting and 28 using short-acting agents. 59.5% (n=75) of orthopaedic middle grades that did not use nerve blocks felt they were unnecessary, while 22% (n=28) had worries about compartment syndrome and 18% (n=23) were not confident with the technique. 131 out of 171 (77%) orthopaedic middle grades would be more worried about compartment syndrome in high energy injuries.

Conclusion: Most units appear to have no protocol guiding the use of femoral nerve blocks. ED middle-grade staff were more likely to use a block than orthopaedic staff, and the most common reason for not doing so was feeling that a block was unnecessary. Our results suggest that there is future scope for developing a universal protocol for analgesia when splinting femoral fractures.

Disclosure: No significant relationships.

PS022 Suturing the Injured Meniscus – Results in 563 Menisci

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Introduction: Authors present their experiences and results of meniscus preserve operations in overview of 14 years.

Material and Methods: Suture of injured meniscus preserve preinjured conditions in injured compartment and could prevent overloading of cartilage, which comes after meniscectomy. From January 1994 to December 2007 authors sutured 563 injured meniscus in time 2-23 days after injury, 425 medial and 138 lateral. Contemporary lesions: ACL rupture in 241 patients, PCL rpt in 5 patients, second meniscus injury 36 patients, cartilage damage in 258 patients. For meniscus suture were used inside-out, out-side in and all-inside technique. In 62 patients were contemporary primary ACL reconstruction, 154 patients were ACL reconstruction in second operation, 25 patients remain without ACL reconstruction because no clinical instability of the knee.

Results: All patients were controlled clinically after 1 year after operation. Only 12 patients were symptoms for meniscus pathology. In these patients were provided control arthroscopy, in 7 patients meniscectomy and in 5 patients resuture with good clinical results. Only 398 patients were possible to control until June 2009. Lysholm score: 286 excellent, 102 good, 10 satisfied, IKDC score: all in A and B group, Tegner score: 7.6. From these group 24 patients had new meniscus injury in time 2- 8 years after meniscus reinsertion and arthroscopy for acute haemarthros. In 21 patients were cartilage without damage and 3 patients with chondromalacia until gr. II Outerbridge.

Conclusion: Suture of acute meniscus tears is a method by which is possible to preserve preinjured conditions in weight bearing compartment. Cartilage changes are minimal after meniscus preservation in compare to patients after meniscectomy.

Disclosure: No significant relationships.

PS023 Arthroscopically Assisted Meniscal Allograft Transplantation in the Knee: A Medium-Term Subjective, Clinical and Radiographical Outcome Evaluation

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Introduction: Allograft meniscal transplantation is known as a possible procedure to solve pain and loss of function in the knee of patients with a history of subtotal or total meniscectomy. Medium-term and long-term results after meniscal allograft transplantation in the knee are scarce. In this study patients who received an arthroscopically assisted meniscal allograft transplantation with a follow-up between 5 and 15 years were evaluated using subjective questionnaires, a clinical and a radiographical evaluation.

Material and Methods: Demographic data of all patients were collected and pre-operative results, using the KOOS (Knee injury and Osteoarthritis Outcome Score), the Lysholm score, the Tegner score, the SF 36 and the VAS (Visual Analogue Scale) for pain were compared with actual results of those questionnaires to evaluate the therapeutic effects of allograft meniscal transplantation in the knee during medium-term follow-up. Patients were evaluated with a standardized clinical examination of the knee to objectivate knee related symptoms. Standard weight bearing radiographs and a full leg standing radiograph were performed to evaluate the evolution of osteoarthritis and malalignment.

Results: For all questionnaires (VAS, KOOS, Lysholm, SF 36) there is a significant ($p < 0.0001$) and clinically relevant increase in post-operative score. This improvement stays consistent during the follow-up period. The more severe the osteoarthritis, the lower the improvement. Despite the meniscal transplantation, there is still a significant ($p = 0.0006$) increase in osteoarthritis. An increase in osteoarthritis grade was seen in 42% of the patients, as scored following the Kellgren-Lawrence classification. When strictly respecting the indications, there is no significant correlation between pre-operative cartilage damage, pre-operative osteoarthritis, alignment deviation, gender and body mass index on the one hand and outcome scores or improvement on the other hand.

Conclusion: Meniscal allograft transplantation results in important pain relief and functional improvement in patients with a history of (sub)total meniscectomy and pain localized in the affected

compartment. Strictly following the indications, meniscal transplantation can give good and predictable results.

References: [1] Lubowitz JH, Verdonk PC, Reid JB III, Verdonk R. Meniscus allograft transplantation: a current concepts review. *Knee Surg Sports Traumatol Arthrosc* 2007; 15 : 476-492. [2] Fabricant PD, Jokl P. Surgical outcomes after arthroscopic partial meniscectomy. *J Am Acad Orthop Surg* 2007; 15 : 647-653. [3] Milachowski KA, Weismeier K, Wirth CJ. Homologous meniscus transplantation: Experimental and clinical results. *Int Orthop* 1989; 13 : 1-11. [4] Verdonk PC, Demurie A, Almqvist KF, Veys EM, Verbruggen G, Verdonk R. Transplantation of viable meniscal allograft. *J Bone Joint Surg Am* 2006; 88 : 109-118. [5] Jackson DW, Whelan J, Simon TM. Cell survival after transplantation of fresh meniscal allografts: DNA probe analysis in a goat model. *Am. J. Sports Med* 1993; 21 : 540-549. [6] Gelber PE, Gonzalez G, Lloreta JL, Reina F, Caceres E, Monllau JC. Freezing causes changes in the meniscus collagen net: a new ultrastructural meniscus disarray scale. *Knee Surg Sports Traumatol Arthrosc* 2008; 16 : 353-359. [7] Sekiya JK, Ellingson CI. Meniscal allograft transplantation. *J Am Acad Orthop Surg* 2006; 14 : 164-174. [8] Shelton WR, Dukes AD. Meniscus replacement with bone anchors: a surgical technique. *Arthroscopy* 1994; 10 : 324-327. [9] Paradowski PT, Bergman S, Sundén-Lundius A, Lohmander LS, Roos EM. Knee complaints vary with age and gender in the adult population. Population-based reference data for the Knee injury and Osteoarthritis Outcome Score (KOOS). *BMC Musculoskelet Disord* 2006; 7 : 38. [10] Donders A, Van der Heijden G, Stijnen T, Moons K. A gentle introduction to imputation of missing values. *Journal of Clinical Epidemiology* 2006; 59 : 1087-1091. [11] Verdonk PC, Verstraete KL, Almqvist KF, De Cuyper K, Veys EM, Verbruggen G, Verdonk R. Meniscal allograft transplantation: long-term clinical results with radiological and magnetic resonance imaging correlations. *Knee Surg Sports Traumatol Arthrosc* 2006; 14 : 694-706. [12] Chang HC, Teh KL, Leong KL, Mak SL, Karim SA. Clinical evaluation of arthroscopic-assisted allograft meniscal transplantation. *Ann Acad Med Singapore* 2008; 37 : 266-272. [13] Van Arkel ER, De Boer HH. Survival analysis of human meniscal transplantations. *J Bone Joint Surg Br* 2002; 84 : 227-231. [14] Sturnieks DL, Besier TF, Mills PM, Ackland TR, Maguire KF, Stachowiak GW, Podsiadlo P, Lloyd DG. Knee joint biomechanics following arthroscopic partial meniscectomy. *J Orthop Res* 2008; 26 : 1075-1080.

Disclosure: No significant relationships.

PS024 Comparison of Primary Anterior Cruciate Ligament Reconstruction by Patellar Tendon and Hamstring Tendon Autograft: Is There a Difference in Outcome and Donor Site Morbidity?

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Introduction: Despite the high frequency of anterior cruciate ligament reconstructions there is no uniformly accepted agreement regarding the choice of the ligament graft. The most commonly used grafts are the bone-patellar tendon-bone autograft (PT), and the

semitendinosus and gracilis tendon autograft (HT). The purpose of this study was to compare the outcome of these two autografts (PT and HT), with special emphasis on clinical long-term results and morbidity of the patients undergoing all operative procedures by a single surgeon.

Material and Methods: We reviewed the clinical records of 47 patients (12 female and 35 male patients) with an average age of 28 (15 – 40) years at the time of surgery who underwent ACL reconstruction by a single surgeon, either with a patellar tendon or a hamstring tendon graft in a 54 months period. 27 patients underwent ACL reconstruction by a patellar tendon graft (PT group), whereas 20 patients were treated by a hamstring tendon graft (HT group). Patients of the PT-group were additionally separated in two subgroups (PT-1 for single incision, and PT-2 for two-incision technique), relating to the graft harvesting method.

Results: Referring to the outcome of the IKDC score more than 87% of patients reported normal (grade A) or nearly normal (grade B) knee function. Comparing between PT grafts and HT grafts, as well as between PT-1 and PT-2 incision techniques, there were no notable differences between the study groups. With regards to the outcome of the KOOS there were no significant differences between patients with PT and HT grafts, as well as between patients with one-incision or two-incision techniques. Referring to the KOOS subscale of sports and recreation patients with HT grafts had slightly better results compared to those with PT grafts. Relating to harvest site symptoms, there was no significant differences comparing the study groups. With regards to kneeling pain, patients within the PT group had a significantly higher incidence of pain than patients in the HT group.

Conclusion: In summary, we had encouraging results after arthroscopically assisted anterior cruciate ligament reconstruction, either with a patellar tendon or a hamstring tendon autograft. We did not find any notable differences between these two techniques, although patients following patellar tendon graft harvesting procedures showed an increased kneeling pain after surgery. Comparing the traditional single incision procedure to the newer subcutaneous two-incision method for graft harvesting of the mid-third of the patellar tendon, we had similar results with both techniques.

Disclosure: No significant relationships.

PS025 Middle Geniculate Artery Injury Following Knee Arthroscopy: A Case Report

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Introduction: Vascular complications following knee arthroscopy are rare, with a reported incidence of less than 1%, usually involving popliteal artery trauma. Middle geniculate artery damage is unusual, however, with only pseudoaneurysm and embolism cases in the literature. We report a case of middle geniculate artery damage following arthroscopy and partial medial meniscectomy. Diagnosis was made by angiography, and bleeding stopped without any further intervention.

Material and Methods: A 48 year-old female underwent an arthroscopy for medial joint pain. She had no past medical history of note. Arthroscopy was carried out under general anaesthesia (by the senior author), and revealed a medial meniscal tear extending into the posterior horn. This was trimmed and shaved using a synovator.

During the procedure there was brisk arterial bleeding, noticeable even with the tourniquet. During slow release of the tourniquet, arterial bleeding became more pronounced.

Results: The patient underwent a femoral angiogram revealed the middle geniculate artery as the bleeding source. The vessel stopped bleeding and no embolisation was carried out. The patient had made an uneventful recovery by follow-up, with no significant post-operative drop in haemoglobin concentration.

Conclusion: The advent of arthroscopy has greatly improved morbidity associated with orthopaedic surgery. However, this case illustrates the importance of awareness of vascular damage as a complication during arthroscopy. We feel that an urgent angiogram should be carried out in order to identify, and if necessary, treat such an occurrence.

Disclosure: No significant relationships.

PS026 Infrapatellar Nerve Damage, a Possible Cause for Chronic Anterior Knee Pain After Tibial Nailing?

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Introduction: Intramedullary nailing of the tibia has become the conventional therapy for tibial shaft fractures. One of the most common complaints associated with this procedure is chronic knee pain. Incidence rates between 10% and 86% have been reported and a significant number of patients have problems in kneeling, affecting professional and recreational activities. Surgical damage to the infrapatellar nerve is one possible causative factor for post-nailing knee pain. The infrapatellar nerve is exclusively sensory and runs subcutaneously almost perpendicular to the patellar tendon just below the patella. The purpose of this study was to determine the prevalence of chronic knee pain in our institute and its relation with sensory disturbances in the knee area.

Material and Methods: A chart review was conducted. All patients between 15 and 65 years with healed traumatic tibial shaft fractures treated with an intramedullary nail between 1998 and 2008 were included. Exclusion criteria were: fracture lines extending into the knee or ankle joint, any other fracture in the affected leg, lacerations in the knee area, pre-operatively existing knee pain and loss of follow-up. Chronic knee pain was defined as persisting pain in the knee area 6 months after tibial nailing. Sensory disturbances were defined as hyperesthesia or anesthesia at the nail entry site.

Results: 97 patients (99 fractures) were included. 29 patients mentioned knee pain more than 6 months after tibial nailing. 20.7% of patients in this group experienced sensory disturbances of the knee prior to developing chronic knee pain, compared with 5.7% of patients without chronic knee pain ($p < 0.05$). Odds ratio for developing chronic knee pain was 4.3 for patients with sensory disturbances of the knee, compared with patients without sensory disturbances (95% CI 1.1-16.6). Mean follow-up of patients with chronic knee pain was 5.5 months longer (18.9 versus 13.4, $p < 0.05$) and more tibial nails were removed in this group (62.1% versus 35.7%, $p < 0.05$).

Conclusion: 29.3% of the patients in our study population experienced chronic knee pain which was associated with preceding sensory

disturbances of the knee. This sensory disturbances suggest injury of the infrapatellar nerve, which is at great risk to be transected during incision placement for tibial nailing. Based on the current results, a prospective study on infrapatellar nerve damage after tibial nailing will be conducted.

Disclosure: No significant relationships.

POLYTRAUMA; RESEARCH

PS027 Severely Injured Trauma Patients (ISS > 15) and CT Scan in the Early Diagnostic Workup

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Introduction: In severely injured trauma patients there is a narrow window of time for diagnosis and treatment. That's the reason why radiological imaging is highly coded during initial assessment. After an initial examination, radiography and ultrasounds are usually performed. Imaging is frequently supplemented by CT scan of selective body areas. The best treatment comprehends the best diagnostic program in the minimum time. Although the unstable trauma patients would theoretically benefit the most from a CT diagnostic program, the clinical conditions don't allow in these patients to waste too much time far from the safe area. In these patients x-rays and ultrasounds play an important role for screening, assuming that CT might require too much time. CT scanning during the initial workup was evaluated.

Material and Methods: Patients data (June 2008- january 2009) were selected from the local trauma registry. A complete time registration was performed including admission and diagnostic time. Data on severe trauma patients (ISS>15) were reviewed focusing on CT scan. Minor cranial trauma were excluded according to a specific algorithm. An extensive use of CT in hemodynamically stable and "temporary" stable patients was recommended. Conventional x-rays were performed in unstable patients and if SatO₂<93% in air or if <96% in intubated patients or FiO₂≥0.5. Eco-FAST was liberally performed before CT. Contrast enhanced CT scan was performed. Prediction of death was defined by TRISS.

Results: 162 pts were evaluated. No patient died during CT scan or during transport to and from CT area. Overall mortality was 9%. 89% of the severe trauma patients were diagnosed by CT scan (mean time 52 minutes) and 2% were scanned immediately. In the first semester 33% were scanned in the first 40 minutes, median start time 46 min. 42% were scanned in the first 40 min. in the second semester, mean time 63 min. 56% were scanned in the first 40 min., in the third semester, mean time 48 min.

Conclusion: CT scan during the early diagnostic workup in severe trauma patients is safe even in temporary unstable ones. Current imaging algorithms that including US and conventional Rx before CT might be reassessed.

References: 1) Huber-Wagner S, Lefering R, Qvick LM, Körner M. Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicenter study.

The Lancet 2009; 373: 1455-1461. 2) Saltzherr TP, Fung Kon Jin PHP, Bakker FC, Ponsen KJ. An evaluation of a shockroom located CT scanner: a randomized study of early assessment by CT scanning in trauma patients in the bi-located trauma center North-West Netherlands (REACT trial). BMC Emergency Medicine 2008; 8:10. 3) Fung Kon Jin PHP, van Geene AR, Linnau KF, Jurkovich GJ, Ponsen KJ, Goslings JC. Time factors associated with CT scan usage in trauma patients. European Journal of Radiology 2009;72:134-138
Disclosure: No significant relationships.

PS028 An Optimized Assessment of Severely Injured Patients – Documentation of Black Spots

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Introduction: The success of traffic safety improvement strategies are based on documentation. Analysis and remedy of black spots in addition to improvement in automobile production, the work of traffic engineers, politicians, traffic regulations, police and medical care. To create priorities, the traffic statistics differentiates accidents in a 3-class system in relation to severe accidents: slightly injured, severely injured and fatally injured (death). This study assesses the validity of the existing classification of severely injured compared with the actual injury severity.

Material and Methods: We analysed accidents resulting in severely injured people in one year in a city model. Synchronization of anonymous police documentation with the medical notes of admitted casualties which were validated by established trauma scores and medical classification. A correlation analysis of length of stay should give indications of an actual injury severity.

Results: The study group showed an ubiquitous range of age, sex and injuries. The range of MAIS, ISS and NACA index shows the inhomogeneity of the people classified as severely injured. 66% of the study group revealed ISS less than 16 which means not poly-traumatized patients. The correlation analysis of Spearman certifies the validity of these scores (r MAIS-NACA=0.799 and r ISS-NACA=0.831). The further differentiation on the basis of MAIS, ISS and NACA showed 47.8% of the study group should be classified as slightly injured and 89% were discharged in less than 3 days.

Conclusion: This study shows that the traffic safety classification of severely injured people is not sufficient and most severely injured people are not approximately recorded. We advise a new continuous links between police and medical data to be inevitable for future improvements in traffic safety. The use of established trauma scores and a differentiated look of lengths of stay could be an attempt.

Disclosure: No significant relationships.

PS029 Presence of Lumbar Transverse Process Fractures with Multiple Injuries for Hemodynamically Unstable Patients

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Introduction: Although lumbar transverse processes (LTPF) fractures are considered relatively minor injuries compared with other vertebral fractures, they occur as a result of major traumatic forces that can result in pelvic or visceral injuries [1-5]. This study examined the impact of multiple LTPF with pelvic or visceral injuries during primary trauma resuscitation.

Material and Methods: Using retrospective review at our Level I trauma center between 2007 and 2009, we identified blunt trauma patients who had LTPF along with pelvic or visceral injuries. The displacement of LTPF was reviewed on computed tomography (CT).

Results: Retrospective review identified 66 trauma patients who had pelvic or visceral injuries. Thirteen of 66 patients (20%) had multiple LTPF. Four of 13 patients (31%), who were all hemodynamically unstable initially, had anterior displacement of LTPF. In addition, because of consistent hemodynamic instability after successful transcatheter arterial embolization (TAE) for pelvic or visceral injuries, they continuously required TAE for multiple LTPF. Angiography showed aggressive hemorrhage from injured lumbar arteries at the same level of the displaced LTPF, regardless of contrast medium extravasation on CT. TAE for lumbar artery injuries was successful and their hemodynamics were stabilized. The remaining 9 patients (hemodynamically stable, n=5; hemodynamically unstable, n=4) who had multiple LTPF with lateral or posterior displacement did not require TAE for LTPF after hemostasis of major injuries.

Conclusion: Anterior displacement of multiple LTPF associated with multiple injuries may be a cause of life-threatening hemorrhage, especially for hemodynamically unstable patients. In these situations, missed existence or delayed management of LTPF in primary trauma resuscitation may be devastating, and TAE should be an initial priority.

References: [1] Krueger MA, Green DA, Hoyt D, et al. Overlooked spine injuries associated with lumbar transverse process fractures. Clin Orthop 1996;327:191.

[2] Harrington T, Barker B. Multiple trauma associated with vertebral injury. Surg Neurol 1986;26:149. [3] Harrington T, Barker B. Multiple trauma associated with vertebral injury. Surg Neurol 1986;26:149. [4] Miller CD, Blyth P, Civil ID. Lumbar transverse process fractures-a sentinel marker of abdominal organ injuries. Injury 2000;31:773-6. [5] Patten RM, Gunberg SR, Bradenburger DK. Frequency and importance of transverse process fractures in the lumbar vertebrae at helical abdominal CT in patients with trauma. Radiology 2000;215:831-4.

Disclosure: No significant relationships.

PS030 Complex Lumbosacral Fracture-Dislocation with Pelvic Ring Disruption and Vertical Shear Sacral Fracture: A Case Report of Late Presentation

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Introduction: Combination of severe lumbosacral junction injury with closed vertical shear sacral fracture and disruption of the symphysis pubis is a very rare pattern of injury, particularly in the late presentation. To our knowledge, this complexity of such a lumbosacral injury with pelvic fractures which presented with a chronic condition has never been addressed in previous literatures. We aim to demonstrate a case in which a late presentation of a complex lumbosacral fracture-dislocation, pelvic ring disruption and a vertical shear sacral fracture with neurological deficits and emphasize on difficulties for the management and operative technique used for definitive treatment in this case.

Material and Methods: The initial event had occurred 3 months earlier. Closed reduction by skeletal traction had failed; therefore, surgical correction was performed by means of indirect reduction via pedicle screws, iliac screws and the rods system. Definitive stabilization with posterior lumbo-pelvic segmental fixation and posterolateral fusion were performed using posterior approach.

Results: At 21-month after surgery, clinical result was satisfactory with almost complete correction of deformity and solid posterolateral fusion. A patient had partial recovery from the preoperative neurological deficit. He could stand while holding with a stretcher by himself. He could walk with walker independently using bilateral ankle-foot orthoses.

Conclusion: We reported a patient with very unusual complex spondylo-pelvic injury pattern with late presentation which required meticulous planning of management, imaging, and surgical technique before definitive treatment.

References: [1]. Tsirikos AI, Saifuddin A, Noordeen MH, et al. Traumatic lumbosacral dislocation: report of two cases. *Spine* 2004;29:164-8. [2]. Athanasios IT, Asif S, Noordeen MH, Stewart KT. Traumatic lumbosacral Dislocation report of two cases. *Spine* 2004;29:E164-E168.

Disclosure: No significant relationships.

PS031 Long-Term Survival After Surgical Intensive Care Admission: 50% Dies Within 10 Years

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Introduction: Intensive care unit (ICU) treatment of surgical patients comes along with major disadvantages which have to be justified by an acceptable short- and long-term outcome. Short-term effect of ICU treatment have been well documented. The aims of this study were to quantify the long-term survival of more than 10 years follow up of a large cohort of patients admitted to a surgical intensive care unit and to investigate the effects of age, gender and underlying disease on this long-term survival.

Material and Methods: Of all surgical patients admitted to the ICU of the St. Elisabeth hospital between 1995 and 2000, patient characteristics, disease category, APACHE II score and survival were prospectively registered. A follow up with a mean of 8 years after discharge was achieved. The independent association of multiple co-variables was done using cox proportional hazard analysis.

Results: Of the 1822 patients included, 936 (51%) had died within 11 years. Overall ICU and in-hospital mortality were 11 and 16% respectively. Age, gender, APACHE II score, the need for dialysis and surgical classification were independently associated with long-term survival. Mortality increased with age of admittance to the ICU (hazard ratio 1.1), whereas female patients had a lower chance to die, HR 0.8. However, the pre-admission disease did not influence long-term outcome. Long-term mortality rates in various surgical classification groups varied between 29% for trauma and 80% for gastro-intestinal patients. In gastro-intestinal, oncological, general surgical and/or high-aged patients a negative effect on mortality persisted beyond 5 years. The mortality ratio was increased two-fold in comparison to the general population (51 vs 27%).

Conclusion: Ten years after ICU discharge, survival was only 50%. After ICU treatment survival follows distinct patterns in which age, gender, surgical classification, the need of dialysis and APACHE II score are independent determinants, and long lasting.

Disclosure: No significant relationships.

PS032 Implementation of NICE Guidelines in Management of Head Injury in a District General Hospital Orthopaedic Unit

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Introduction: To assess the outcomes of management of head injury patients in an orthopaedic unit at a district general hospital treated according to NICE guidelines.

Material and Methods: A retrospective audit of patients admitted with head injury in a district general hospital between July '05 to Mar '09. An average of 3000 patients with head injuries attend the A/E department each year, of which average 125 patients require inpatient treatment each year.

The audit involved review of case notes and CT scan results of the patients requiring inpatient treatment for head injury. The notes were studied for mechanism of head injury, any associated risk factors, time to CT scan (specially out of hours), time of neurosurgical referral and the delays in transfer to the specialist neurosurgical unit. The management was compared against NICE Head Injury guidelines published in Sept '07, concentrating on any positive impacts of implementation of these guidelines.

Results: Of the 475 patients treated with head injury, 25 patients (6%) had adverse outcomes despite implementation of NICE guidelines. The reasons for this being delays in obtaining CT scan and delays in input and transfer to regional neurosurgical unit.

Conclusion: Time is the essence whilst managing a patient with head injury. Prompt CT scan to pick up subtle early signs of potentially fatal head injuries and urgent referral to regional neurosurgical unit can prevent adverse outcomes.

Disclosure: No significant relationships.

PS033 Ventilation in Severely Injured Patients Before Admission at Hospital and Survival Rates

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Introduction: Trauma is the first cause of mortality in population below forty years old in Europe. The survival rates after resuscitation in severely injured patients are very low worldwide. In this study we pretend to analyse the effect of prehospital ventilation of those patients on survival rates.

Material and Methods: Twenty severely injured patients were collected and admitted to the hospital by Emergency Team. Three patients were excluded from the study because they were in cardiac arrest and Cardiopulmonary Resuscitation was started. Mean age: 39 years and M/F: 15/2. Ventilatory support was managed in those patients (17). Eight patients were admitted to the hospital after severe injury by their relatives and ventilation was not managed prehospital.

Results: Mean arrival time was 9.5 min, mean time at the scene 19 min and mean transport time 10 min in group with prehospital ventilatory support. For patients who were transported by their relatives/witnesses the mean arrival time was more than 25 minutes. In group with prehospital ventilation, the majority of patients, twelve-70% had multiple organ system injuries, four patients-23% had severe head injuries and one patient-6% spinal injury. In the second group four patients-50% had organ system injuries and four had head injuries.

Six patients from group A and 2 from group B were immediately admitted to the operating room and we had only one death. Full neurological recovery was achieved in all the others. The patients with head injuries were admitted to neurosurgical departments and only one patient was directly taken to the operating room.

Conclusion: Resuscitation of severely injured patients prehospitally with ventilation should start immediately from a witness of the scene. Patients who suffer immediately traumatic asphyxia would avoid cardiac arrest, if resuscitation starts at the scene. Hypoxia is a cause of death of such patients.

Disclosure: No significant relationships.

PS034 Does Damage Control External Fixation Negatively Influence Healing and Infection Rates of Femoral Shaft Fractures?

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Introduction: Femoral nailing causes an influx of fat in the circulation. In the multiply injured patient, especially in the patient with concomitant lung or brain contusion, this can lead to ARDS, fat embolism syndrome and multiple organ failure. The timing and kind of fixation of femoral fractures in patients with multiple injuries is controversially. The advantage of damage control orthopaedics

(external fixation) would be less fat embolisation but some authors report more problems of infection and delayed healing. The aim of our study was to investigate the effect of external fixation on healing and infection rates of femoral shaft fractures in the multiply injured patient.

Material and Methods: Between January 1998 and January 2008, we treated 230 femoral shaft fractures. In this group there were 122 polytrauma patients with a total of 137 fractures. We compared the rate of infection and delayed union in the group treated by damage control external fixation to the group primarily treated by intramedullary nailing.

Results: No significant difference in infection or union rates could be demonstrated between the damage control external fixation and the primary nailing group. We also noted that there's a correlation between the complexity of the fracture and the percentage of prolonged healing. And although not statistically significant there seems a tendency of less healing problems with the reamed femoral nail in comparison with the unreamed femoral nail.

Conclusion: Damage control external fixation does not increase the risk of infection or prolonged healing thus it can be considered a safe approach in the polytraumatized patient.

Disclosure: No significant relationships.

PS035 Treatment Strategy of Open Long Bone Fractures for the Patients with Head Injuries

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Introduction: Open long bone fractures are surgical emergency. However it is often difficult for surgeons to decide the priority of the procedure when the patients have head injuries. Appropriate decision for the treatment is mandatory in a short time in such cases. In this study, clinical courses of the head-injured patients with open long bone fractures treated in our facility were reviewed and treatment protocol was established in order to determine the adequate treatment promptly.

Material and Methods: Retrospective review of charts and registry data of patients admitted to our emergency centre March of 2002 to September of 2008. 21 open long bone fractures of 20 patients (10 male, 10 female) with head injuries were included in this study. Average age at the time of injury was 50 (21-76) years old. The site of open fracture and its treatment method, involvement of craniotomy, complications were investigated and treatment protocol was established.

Results: Open fracture sites included lower leg: 11 cases, humerus: 5 cases, femur: 3 cases, radius: 2 cases. 9 cases with GCS 9 and over required no neurosurgical intervention and definitive fracture fixation following thorough debridement was performed on the day of injury. External fixators were applied in remaining 12 cases. Craniotomy was performed in 9 cases. Craniotomy and open long bone fracture fixation were done in the same operative setting at the day of injury in 5 of 9 cases. External fixator was applied on all 5 cases and definitive treatment was planned after stabilization of general condition. Definitive fixations were performed on 3 cases and 2 patients

died due to head injury. There were no orthopaedic complications in all patients such as deep infection or nonunion etc.

Conclusion: For the patients with open long bone fractures and severe head injury, application of external fixators was beneficial for the concept of damage control^{1, 2}. In our established surgical protocol, for the patients with GCS 9 and over, definitive treatment can be considered for the open long bone fractures following stabilization of general status if neurosurgery is not required. For the patients with GCS 8 and under, ICP monitoring is indispensable and external fixation should be performed regardless of neurosurgical intervention. New established protocol may precisely conduct the surgeons for decision making in chaotic emergency situations.

References: 1. Scalea TM, Boswell SA, Scott JD, et al: External fixation as a bridge to intramedullary nailing for patients with multiple injuries and femur fractures: Damage control orthopedics. *J Trauma* 48: 613 – 623, 2000. 2. Hildebrand F, Giannoudis PV, Krettek C, et al: Damage control: extremities. *Injury* 35: 678 – 689, 2004

Disclosure: No significant relationships.

PS036 Evaluation of Rib Fractures in Patients with Blunt Chest Trauma by Using Axial Computed Tomography and Three-Dimensional Volume-Rendered Images

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Introduction: The purpose of this study was to retrospectively evaluate rib fractures in patients with blunt chest trauma by using axial computed tomography (CT) and three-dimensional (3D) volume-rendered images.

Material and Methods: Between 2009 January and 2009 May, 52 patients (36 man and 16 women; mean age, 55.4 years \pm 21.8; range, 10–94 years) with blunt chest trauma underwent chest CT examinations within a few hours after trauma using a 64-slice multidetector row CT scanner at our institution. Thereafter, 3D volume-rendered images were reformatted from these data. All axial CT and 3D volume-rendered images were retrospectively and randomly reviewed by two diagnostic radiologists with 15 and 12 years experience, respectively, by consensus.

Results: In 44 of the 52 patients (84.6%), there were 219 rib fractures; in the remaining 8 patients, they had no rib fractures. The mean number of rib fractures per patient was 4.2 ± 4.1 (range, 0–20). The mean time of evaluation by using 3D volume-rendered images ($142.4 \text{ sec} \pm 44.1$) was significantly shorter than that of evaluation by using axial CT images ($268.6 \text{ sec} \pm 51.3$; $p < 0.001$). In 3D volume-rendered images, the sensitivity, specificity, positive predictive value, and negative predictive value for diagnosis of rib fractures were 82.6% (181/219), 96.3% (991/1029), 82.6% (181/219), 96.3% (991/1029), respectively; diagnostic accuracy was 93.9% (1172/1248). In axial CT images, the sensitivity, specificity, positive predictive value,

and negative predictive value for diagnosis of rib fractures were 93.2% (204/219), 100% (1029/1029), 100% (204/204), 98.6% (1029/1044), respectively; diagnostic accuracy was 98.8% (1233/1248). In 166 of the 219 rib fractures (75.8%), evaluations by using axial CT and 3D volume-rendered images accorded. In the remaining 53 rib fractures, 15 rib fractures were detected by only 3D volume-rendered images and 38 fractures were detected by only axial CT images. In 38 of total 1248 ribs (3.0%), although 3D volume-rendered images showed rib fractures, we finally evaluated non-fractures because they could not be detected on axial CT images.

Conclusion: Although the time of evaluation of rib fractures by using 3D volume-rendered images was significantly shorter, rib fractures in patients with blunt chest trauma should be not evaluated by using 3D volume-rendered images alone. If rib fractures are evaluated by using 3D volume-rendered images, it should be used with axial CT images.

Disclosure: No significant relationships.

PS037 Do We Still Need Autopsy After Modern Emergency Room Assessment?

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Introduction: The diagnostic information power of a level one emergency room has risen excessively within the last years. The need for quality control, judicial regulations, insurance claims and forensic reasons still lead to a high number of autopsies being performed in patients not surviving the first 48 h after admission to the ER. However, the number of autopsy clarification featured in a level one trauma centre after trauma related deaths considerably vary and also the rate of deathly diagnoses missed within ER assessment of early stage deceased patients differ in the literature.

The aim of this study was to assess the value and necessity of autopsy after modern ER assessment with a multi-slice CT-scan as an integrated part of the diagnostic algorithm.

Material and Methods: Prospectively reviewing our emergency database, case histories, laboratory values and radiological findings compared to findings in autopsy between Jan 2004 and Sep 2007, we charged for missed deathly diagnoses in 87 early stage deceased trauma patients (<48h). Patients were classified into two groups: group 1: patients with limited diagnostic assessment (conventional x-ray, sonography). Group 2: patients with full ER assessment (MSCT). All patients in group 1 could not be sufficiently stabilised in terms of circulation patterns and therefore did not receive full assessment. Non-trauma patients and patients reaching the ER under CPR were excluded.

Results: The autopsy rate of all included patients was 86%. The overall incidence of missed deathly diagnoses was 9.2%. In terms of missed deathly diagnoses, groups varied significantly (group 1: 35.7%; group 2: 4.1%). The ISS after autopsy increased significantly in group 1 from 25 to 37.5. In group 2 there was no difference of ISS between status emergency room and after autopsy.

The most concerned region of missed deathly injuries was thorax with 62.5% of all patients with autopsies followed by pelvic (25%) and spine injuries (12.5%).

Conclusion: In spite of complete and nearly ideal conditions within a modern emergency room assessment nowadays, detecting all diag-

noses is still challenging. Overall, our findings show that almost every tenth early stage deceased patient showed at least one missed potential deathly diagnose in a level one trauma centre. Regarding the insufficient assessment performance in group 1, the relative high rate of missed diagnoses seem explicable. Nevertheless, even having acquired full assessment power (group 2), still 4.1% deathly diagnoses were missed.

For this reason, autopsy is still the most powerful and indispensable tool in finding the “whole” diagnosis. Completeness of autopsies after trauma related death therefore is essential referring a continuous gain of quality.

References: 1. Sharma et al. (2006). “Clinical and autopsy analysis of delayed diagnosis and missed injuries in trauma patients.” *Am Surg*, 72(2): 174-9.

Disclosure: No significant relationships.

PS038 Traumatic Intentional Self-Inflicted Injuries – Surgical Challenges

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Introduction: An international review found that 3%–5% of individuals respond “Yes” to the question “Have you ever attempted suicide?”. Traumatic self-inflicted injuries represent a serious public health issue.

Material and Methods: We retrospectively reviewed the Bucharest Clinical Emergency Hospital records for all attempted and fatal suicides and we performed a retrospective study of patients with intentional self-inflicted injury requiring surgical management (all of them had a traumatic mechanism of injury); drugs and toxic ingestions as suicidal method alone were not included.

Results: Twenty one self inflicted injuries occurred between January 1, 2006, and December 31, 2008. Most of the patients were adult males with an equal urban/rural distribution. Only eight of them (38%) had a known mental health disorder at the time of their attempt. Twelve patients (57%) had a history of alcohol and/or drug abuse. The traumatic mechanisms were stabbed wounds (47%), jumping from heights (43%) and gunshot (10%). Surgical attitude ranged from wound suture to extensive surgery requiring multimodal approach (visceral, vascular, neurologic, orthopedic, urologic surgery). Despite all efforts six patients died (traumatic shock or post-operative complications), and one remain in vegetative status; 66% was recovered after traumatic self induced injuries and was referred for further psychiatric evaluation.

Conclusion: Suicidal attempts in Romania are still low compared with other states but are increasing over the last ten years. Traumatic intentional self-inflicted injuries required a complex and expensive therapy. Efficient psychological and psychiatric campaigns and targeted population screening as well as feedback mechanism between the trauma and mental health systems are needed to prevent injury and death.

References: Prevalence of suicide ideation and suicide attempts in nine countries.- Weissman MM, Bland RC, Canino GJ, Greenwald S,

Hwu HG, Joyce PR, et al.; *Psychol Med* 1999;29(1):9-17 Suicide: the unmet challenge of the trauma system. - Schechter WP, Klassen C, O'Connor P, Potts M, Ochitill H; *Arch Surg*. 2005 Sep;140(9):902-4 Manual for estimating the economic costs of injuries due to interpersonal and self-directed violence. - Butchart A., Brown D., Khanh-Huynh A., Corso P.; World Health Organisation, 2008 Free fall trauma - Tan S, Porter K; *Trauma* 2006 8: 157-167

Disclosure: No significant relationships.

PS039 Emergency Pre-Hospital System in Madeira Islands

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Introduction: with this work we want to presentation how the system functioning in madeira islands since 1999

Material and Methods: we present all the units that is part of the system

Results: we present the results since 1999

Conclusion: the system works in our islands

References: one islands one main hospital seven health centers one pre-hospital system

Disclosure: No significant relationships.

PS040 Experience in a Greek Rural Hospital with Geriatric Trauma Patients

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Introduction: The most rapidly growing sector of the population in every country of European Community is represented by the elderly people (defined as age over 65 years). In rural regions of Greece, that life expectancy is high, the probability to operate such a patient with trauma pathology is very high. Various clinical factors are analyzed for their ability to predict morbidity and mortality in elderly patients sustaining trauma. Decisions about triage, quality assurance, and use of intensive care unit beds are being evaluated in this study, especially for our hospital, that has facilities of a 2nd level trauma center. **Material and Methods:** We have analyzed the records of 3459 geriatric trauma patients (in a retrospective way from January 2002 to June 2009), in order to evaluate their outcome and the possible existence of factors linked to morbidity and mortality. Mean age was of 75.7 years (65-99y).

Results: Mortality rates were higher for men than for women and were significantly higher in patients 80 years and older. Hypoventilation (RR < 9 br/min or MV < 3.5 lt/min), hypotension (SBP ≤ 85 mmHg or MBP ≤ 60 mmHg), or a Glasgow Coma Scale score = 3, were correlated most significantly with mortality. Injury

Severity Score and TRISS were good indexes of mortality and morbidity (need of ICU bed and oncoming recovery).

Conclusion: In the next decades elderly trauma patients may represent the greatest challenge for an optimal care. Improved outcomes and recovery in geriatric trauma patients can be accomplished with the intensive monitoring, aggressive management on the admission and the use of well defined indexes as GCS, ISS, TRISS or probably something really new in the future.

Disclosure: No significant relationships.

PS041 Biocorrosion and Uptake of Titanium Ions by Human Osteoclasts

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Introduction: In a physiological environment metallic biomaterials undergo corrosion through a variety of mechanisms. This study investigated whether, beside the well recognized electrochemical aspect of corrosion, human osteoclasts are able to directly corrode titanium alloys, uptake and finally release corresponding metal ions into their environment. The released ions are believed to cause inflammatory reactions and activate osteoclastic differentiation and activity, which most likely play a role in the pathophysiological mechanisms of aseptic loosening [1].

Material and Methods: Human monocytes and in vitro generated osteoclasts were seeded onto titanium and aluminum (positive control) foils. After 21 days scanning electron microscopy analysis was performed in order to assess whether monocytes were able to grow and differentiate on the metals. In order to visualize uptake and distribution of intracellular metal ions, a novel protocol using confocal microscopy analyses with Newport GreenTM DCF Diacetate Ester staining was developed [2]. Additionally, the concentrations of metal ions released into the culture supernatant were measured using atomic emission spectrometry.

Results: Scanning electron microscopy analysis demonstrated long-term viable osteoclast cultures on metal foils. Confocal microscopy analysis with Newport GreenTM DCF Diacetate Ester staining showed intense fluorescence throughout the cytoplasm and nucleolus of osteoclast cultured on titanium. The findings were confirmed by atomic emission spectrometry investigations showing significantly increased levels of corresponding metal ions in the supernatant of osteoclast cultures.

Conclusion: The present study demonstrates that human osteoclast precursors are able to grow and differentiate towards mature osteoclasts on orthopedic implants. The mature cells are able to directly corrode the metal surface and uptake metal ions. Microscopy analysis provided additional relevant information about the subcellular distribution and interaction of the different metal ions, such as the binding of titanium ions to phosphorylated molecules throughout the cytoplasm and nucleolus of human osteoclasts cultured on titanium. The uptake and ultimately the release of metal ions into the periprosthetic tissues may lead to the formation of osteolytic lesions in the peri-prosthetic bone, contributing to pathomechanisms of aseptic loosening.

References: 1. Cadosch D, Gautschi OP, Chan E, Simmen HP, Filgueira L. Titanium induced production of chemokines CCL17/TARC and CCL22/MDC in human osteoclasts and osteoblasts. J Biomed Mater Res A. 2009 Feb 9. 2. Cadosch D, Meagher J, Gautschi OP, Filgueira L. Uptake and intracellular distribution of various metal ions in human monocyte-derived dendritic cells detected by Newport Green DCF diacetate ester. J Neurosci Methods. 2009 Mar 30;178(1):182-7.

Disclosure: No significant relationships.

PS042 Real Time Monitoring of BMP Signalling During Weightsharing of Tibia and Fibula with an Ex-Fix

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Introduction: A growing body of evidence indicates that mechanical cues modulate the development and repair of skeletal tissue by regulating gene expression. For example, BMP-3 is upregulated with mechanical stimulation. Mechanical cues can selectively modulate osteogenesis in vivo and suggest a potential basis for treatment of fractures. A limitation of existing data is that these studies are limited to the analysis of fixed material. We hypothesize that mechanical unloading of tibia and fibula due to weight-“sharing” in an external fixator results in decreased BMP transcriptional activity as compared to the full weightbearing contralateral limb.

Material and Methods: The murine model used in this study facilitates real time monitoring of BMP Smads transcriptional activity. Transgenic BRE:GFP reporter mice were obtained from the Hubrecht Institute, Utrecht, the Netherlands (courtesy of Professor Christine L. Mummery). The expression of GFP reveals sites where BMP Smad-dependent transcriptional activity is present. The GFP signal was measured under general anaesthesia using non-invasive IVIS 200 Spectrum. GFP signal was quantified using Living Image software (Version 3.0, Caliper Live Sciences Inc.). Nine BRE-GFP mice were used. Mice were allowed unrestricted activity. A mini-external fixator fixed to the proximal and distal tibia was applied under general anaesthesia on day 0. The animals were permitted full weight bearing and unrestricted activity after awakening from anaesthesia. The GFP signal of tibia and fibula in bilateral limbs was measured on days 1, 3, 7, 10 and 14 after application of the external fixator.

Results: Baseline measurements of the GFP-signal ranged from 6.8x10⁹ photons to 3.1x10¹⁰ photons between individual mice. After application of the external fixator, the GFP signal of the unloaded tibia and fibula decreased in all mice to on average 87% of baseline on day 1 (SD ± 23%, p = 0.07), 71% on day 3 (SD ± 31%, p < 0.05), 71% on day 7 (SD ± 41%, p < 0.05), 80% on day 10 (SD ± 41%, p = 0.09) and 71% on day 14 (SD ± 23%, p < 0.01). In the contra-lateral non-operated limb, the GFP signal increased to an average 129% on day 1 (SD ± 88%, p = 0.17), 154% on day 3 (SD ± 85% p < 0.05), 164% on day 7 (SD ± 105%, p = 0.05), 150% on day 10 (SD ± 58%, p < 0.05) and 172% on day 14 (SD ± 82%, p < 0.05).

Conclusion: Real time monitoring of BMP signaling during unloading of the mouse tibia and fibula by means of weight-sharing with application of an external-fixator reveals decreased BMP transcriptional activity. This might affect bone fracture healing when a fixator is applied for external fixation of a fracture. Real time monitoring of BMP transcriptional activity of the contralateral non-operated limb shows increased expression of BMP, probably due to increased compensatory weightbearing.

Disclosure: No significant relationships.

PS044 Treatment of Staphylococcal Tibia Osteomyelitis in Rabbits by Antibiotic Loaded Allograft and Antibiotic Loaded Acrylic Bone Cement

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Introduction: The aim of the present study was to assess the effect of antibiotic loaded fresh-frozen allografts and compare it with antibiotic loaded acrylic bone cement in staphylococcal tibia osteomyelitis and to combine the effects of bone repair and eradication of infection in one stage surgery.

Material and Methods: A unicortical 6.5-mm-diameter defect was created in the proximal tibial metaphysis of thirty-six New Zeland albino rabbits. After contaminating the wounds with 2x10⁸ colony forming units of staphylococcus aureus, we divided the animals into four groups. The negative control group received no treatment, the positive control group received teicoplanin-impregnated polymethylmethacrylate beads, the allograft group received fresh-frozen allografts and the experimental group received teicoplanin-impregnated fresh-frozen allografts. Histopathological evaluation with light microscope were made and intraosseous tissue cultures were performed on postoperative day 28. Clinical evaluation in a daily-routine were made.

Results: The cultures showed no evidence of intramedullary infection in the experimental or the positive control group in eight of the nine rabbits, but they were positive for staphylococcus aureus in one of the nine rabbits in the experimental group, one of the nine rabbits in the positive control group and all of the rabbits in the negative control and allograft groups. The experimental group and the positive control group has similar effects in eradication of the infection.

Conclusion: Teicoplanin-impregnated allografts was effective in preventing intramedullary staphylococcus aureus infection in a staphylococcal tibia osteomyelitis model. This combination therapy could potentially eliminate the need for surgical removal of cement beads. Using an antibiotic-graft compound, eradication of pathogens and grafting of bony defects may be carried out in a one stage procedure.

References: 1.Hanssen AD. Local antibiotic delivery vehicles in the treatment of musculoskeletal infection. Clin Orthop Relat Res 2005; 91-6. 2.De Long WG, Jr., Einhorn TA, Koval K, McKee M, Smith W, Sanders R, et al. Bone grafts and bone graft substitutes in orthopaedic trauma surgery. A critical analysis. J Bone Joint Surg Am

2007; 89: 649-58. 3.Chan YS, Ueng SW, Wang CJ, Lee SS, Chen CY, Shin CH. Antibiotic-impregnated autogenic cancellous bone grafting is an effective and safe method for the management of small infected tibial defects: a comparison study. J Trauma 2000; 48: 246-55. 4.Kabak S, Tuncel M, Halici M, Tutus A, Baktir A, Yildirim C. Role of trauma on acute haematogenic osteomyelitis aetiology. Eur J Emerg Med 1999; 6: 219-22. 5.van de Belt H, Neut D, Schenk W, van Horn JR, van der Mei HC, Busscher HJ. Gentamicin release from polymethylmethacrylate bone cements and Staphylococcus aureus bio-film formation. Acta Orthop Scand 2000; 71: 625-9.

Disclosure: No significant relationships.

LOWER EXTREMITY

PS045 Knee Septic Arthritis from Streptococcus Pluranimalium in Humans. First Case Reported in the Literature

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Introduction: We first report a case of an infection in humans by streptococcus pluranimalium, a new streptococcal species that has been isolated in the genital tract and tonsils of cattle, tonsils of a goat and a cat, and from the crop and the respiratory tract of canaries. According our knowledge there are a few reports in the literature reporting infections by this strain of streptococcus in animals, but never since now in humans.

Material and Methods: A 57 year old farmer, fit and well, non-immunocompromised has been treated in our department, for a close tibial plateau fracture (Schatzker VI), with a circular external fixator. Postoperatively, i.v antibiotics – cefuroxime 1500 mg every 8 h was administrated for 24 hours. Radiological and clinical healing of the fracture achieved successfully within 11 weeks of the fracture. The frame removed and the patient was followed up as an outpatient. Six days after the removal of the frame, the patient turned up to the A&E department, systematically unwell, complaining for a swollen painful knee, and a discharging abscess in one of the proximal pin sites near by the joint line. Fluid samples from the abscess and the knee aspiration, obtained and revealed streptococcus pluranimalium in all samples. Debridement of the abscess and an arthroscopic wash out was performed twice, followed by i.v antibiotics according to the sensitivity test (Levofloxacin (500 mgx2) Ceftriaxone (2grx2)) for six weeks, and p.o antibiotics (clarithromycin 500mg every 12 h and Levofloxacin 500 mg every 12) for another two weeks.

Results: Symptoms were settled and the patient is free of infection for the last 12 months.

Conclusion: We hypothesized that the bacterium was settled on the wires of the circular fixator and was inoculated in the patient during the removal of the frame. According our knowledge, it is the first case of infection in a human individual by this specific strain of streptococcus.

Disclosure: No significant relationships.

PS046 Kinesitherapy in Gonarthrosis and Post-Traumatic Knee Joint Contracture Treatment

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Introduction: Post traumatic knee joint contracture is the most difficult complication of the lower limbs traumas, considerably limits the functional abilities and make the patients invalids. Besides, the frequent consequence of knee joint injury is gonarthrosis, and kinesitherapy is one of the elements of the complex treatment. The basis of the procedure is the joint relief, leading to adjoining muscles tonus lessening, and paraarticular tissues general tense lessening and intra-joint hydrostatic pressure, joint tissues nourishing improvement. The known devices, worked out for kinesitherapy alongside with advantages have a number of construction defects, complicating the procedure

Material and Methods: To provide the controlled stretching of the knee joint we offer - «device for distraction the knee joint» (Favorable decision on the patient delivery according to the application №—2008140089/17(051869) date: 9.10.2008). All the elements of the construction are placed on the metallic frame and the size of distraction is controlled with dynamometer and is measured in kilopowers. A clinical example: Patient K (56 y.o.) was treated in orthopedic department for post traumatic arthrosis of the left knee joint of the IIIrd degree (He was operated on for closed fracture of the external condylus of the left tibia four years ago).

Results: The volume of movements in the joint made 60 degrees (bending – 120, unbending – to 180 degrees). The complex therapy included nonsteroid anti-inflammatory medicines, oxygenotherapy, massage, electrotherapy, mechanotherapy and kinesitherapy with the help of the offered device. Seven procedures were made with the loading increase from 1 to 4 kilopowers. The duration of each procedures made 40 minutes. As the result of the complex treatment the amplitude of movements in the joint increased up to 120 degrees.

Conclusion: The obtained effect allows to recommend the device to use in the complex treatment of knee joint deforming arthrosis.

Disclosure: No significant relationships.

PS047 Pain Scores on the Removal of Ilizarov Frames in Orthopaedic Outpatients Department

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Introduction: Ilizarov frames are still removed in the operating theatre in a lot of centers. This is due to a variety of reasons, the main one being that it is a painful procedure. We decided to evaluate patient satisfaction and pain experienced on removal of Ilizarov frames in an outpatient setting, using oral analgesia and Entonox.

Material and Methods: Seventy consecutive patients, who had their frames removed in the Out Patients Department, had their level of pain scored using a Visual Analogue Score (VAS) and a simple questionnaire.

Results: The mean score for frame removal was 4.7 on the VAS. There was no difference between male and female scores. The age of the patient does make a difference in the pain score, the pain score decreases with the age of the patient. Pain increases when there are 4 or more olive wires to be removed

Conclusion: Removal of Ilizarov frames in the Outpatient department is a moderately painful but well tolerated procedure.

References: none available

Disclosure: No significant relationships.

PS048 Using the Less Invasive Stabilisation System (LISS) Plate in the Treatment of Supracondylar Femoral Fractures: Does it Work and What Lessons can be Learned?

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Introduction: The treatment of supracondylar femoral fractures has undergone several changes during the past century, from non-operative techniques to more recently internal fixation. A new concept of minimally invasive plate osteosynthesis (MIPO) which considers bone healing [1] has led to the Less Invasive Stabilisation System (LISS) [2]. This is an internal fixation plate that combines closed fixation of the distal femur using an anatomically pre-contoured plate with locked unicortical screws. In this study, we aimed to assess whether the LISS plate was effective in the treatment of supracondylar femoral fractures, and if it was sufficient in all severities of fractures.

Material and Methods: All patients who acquired a supracondylar femoral fracture (AO/OTA Type 33A1 to 33C3) between 1st January 2004 and 1st June 2008 were retrospectively recruited. Only those treated with a LISS plate were included in this study. Demographic data plus mechanism of injury, type of fracture, injury severity score and complications were assessed between different fracture classifications. Ultimately, the time taken for radiological union and radiological complications was sought.

Results: In total, 88 patients presented with a supracondylar femoral fracture, of which 46 were treated with a LISS plate. Two patients were excluded from follow-up as one had died, and the other had relocated leaving a study group of 44 patients. The mean age of the patients was 66.1 (range 9 - 99), with 15 males and 29 females. The mean injury severity score was 11. There were 14 Type 33A1, 13 Type 33A2, 6 Type 33A3, 1 Type 33B2, 1 Type 33C1, 5 Type 33C2 and 4 Type 33C3 fractures. Radiological union was achieved within 6 months (range 2 - 6) in 33 cases. Patients with severe (Type 33C1-33C3) fractures stayed significantly longer in hospital post-operatively ($p = 0.004$). Among these, 5 were non-unions which were managed by a retrograde nail or another locking compression plate. Six cases of less severe fractures exhibited delayed union due to poor fixation technique, as screws lacked medial contact.

Conclusion: Our data shows that LISS plates are indeed effective in the treatment of supracondylar femoral fractures. However, important learning points are that when fixating with a LISS plate, the screws must achieve medial contact to fully stabilise the fracture. Furthermore, we recommend for more severe Type 33C1 to Type 33C3 fractures, an additional locking compression plate for the medial aspect of the fracture to promote bone healing and ultimately improve the likelihood of radiological union.

References: [1] Farouk O, Krettek C, Miclau T, Schandelmaier P, Guy P, Tschern H. Minimally invasive plate osteosynthesis and vascularity: preliminary results of a cadaver injection study. *Injury* 1997;28(Suppl 1):A7—A12. [2] Frigg R, Appenzeller A, Christensen R, Frenk A, Gilbert S, Schavan R. The development of the distal femur less invasive stabilization system (LISS). *Injury* 2001;32(Suppl 3): SC24—31.

Disclosure: No significant relationships.

PS049 Diagnostic and Therapeutical Problems in Proximal Metaphyseal Tibial Fractures

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Introduction: The proximal metaphyseal tibial fractures are difficult to treat due to their frequent association with tibial plateau fracture and due to their aspect, which is often comminuted and has a significant impact on the function of the knee. Surgery has to restore local anatomy and to allow early rehabilitation, meaning proper evaluation and stabilization of the fracture.

Material and Methods: 24 cases, operated between 01.01.2005 – 01.06.2007 (mean age 22-59 yrs) with proximal metaphyseal tibial fractures, were analysed. Pre-operative planning using CT scan was used. The fractures were complicated with compartment syndrome (4 cases) which needed additional fasciotomy. The fractures were stabilized with : plates and screws (16 cases) or external fixation (8 cases) depending on the soft tissue status. Bone graft was used in 2 cases. The patients were monitored at 1,2,6,12 and 24 months post-operative, concerning: bone healing, restoring of the axis of the knee, joint mobility, septic complications.

Results: The axis of the knee were completely restored in all the cases. Bone healing appeared in all the patients (starting from 2 months- 8 cases, at 3 months in the rest of the fracture) depending on the initial aspect of the fracture. Flexion of the knee was limited in 6cases (25% of the patients) and extension was affected in 4 patients, depending, also, on the initial characteristics of the fracture. The frequency of the complications depended on the initial aspect of the fracture, initial stabilization, time from initial stabilization to final fixation.

Conclusion: Results after surgery for tibial plateau fractures depend on the initial aspect of the fracture, but also on the results of surgery . The method proposed by the authors, which allows the suspension of the articular surface, is valuable especially when the fracture is comminuted and has small fragments.

References:

Bucholz, Robert W.; Heckman, James D.; Court-Brown, Charles M.-Rockwood & Green's Fractures in Adults, 6th Edition–2006 Lippincott Williams & Wilkins

Disclosure: No significant relationships.

PS050 Treatment of Complex Tibial Plateau Fractures (Type V&VI of Schatzker Classification) BY Double Plate (Medial and Lateral) Fixation with Single Anterior Incision

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Introduction: Complex tibial plateau fractures (type V&VI of Schatzker classification) are the major problem in orthopedic surgery and associated with high complication rates. There are many alternatives in treatment of these fractures.

The aim of this study was to evaluate the results of double plating (medial and lateral) with single anterior incision in these fractures.

Material and Methods: 22 patients (16 males and 6 females) with type V and VI of Schatzker classification of tibial plateau fractures (14 cases were type V and 8 cases were type VI) were treated by double plating (medial and lateral) with single anterior incision method between May 2004 and May 2007. The bony and functional outcome was evaluated according to modified ASAMI protocol.

Results: The bony results were: excellent in 20 patients (90/9%), good in 1 patient (4/5%), fair in 1 patient (4/5%), and poor in no patient (0%). The functional results were: excellent in 16 patients (72/7%), good in 4 patients (18/1%), fair in 2 patients (9%), and poor in no patient (0%).

Conclusion: The double plate fixation (medial and lateral) with single anterior incision is the best, effective and simple procedure in treatment of complex proximal tibial fractures (type V and VI of Schatzker classification).

References: 1 - Barei DP, Nork SE, Mills WJ. Functional outcomes of severe bicondylar tibial plateau fractures treated with dual incisions and medial and lateral plates. *J.B.J.S AM.* 2006 Aug;88(8):1713-21

2- Fang Y, Chi L, Wang G, Exploration of surgical approaches of complex tibial plateau fractures. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi.* 2006 Jul;20(7):695-8

3- Higgins TF, Klatt J, Bachus KN. Biomechanical analysis of bicondylar tibial plateau fixation: how does lateral locking plate fixation compare to dual plate fixation? *J ORTH. Trauma.* 2007 May;21(5):301-6

4- Rademakers MV, Kerkhoffs GM, Sierevelt IN. Operative treatment of 109 tibial plateau fractures: five to 27 years follow-up results. *J ORTH. Trauma.* 2007 Mar;21(3):218

5- Xie Z, Wu XH, Wang XQ. Treatment of high energy tibial plateau fractures with half ring external fixation combined with minimal internal fixation. *Nan Fang Yi Ke Da Xue Xue Bao.* 2007 Mar;27(3):371-3

Disclosure: No significant relationships.

PS051 Tibial Nonunions – Evaluation of a Standardized Treatment Concept

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Introduction: Nonunions of the tibia represent a complex problem, particularly if they occur at the distal third of the tibia. The aim of the study was to evaluate a standardized treatment concept to manage different types of nonunions of the tibia with regard to their location within the tibia.

Material and Methods: Prospective, non randomised study (01/03-06/08); nonunions of the diaphyseal and metaphyseal tibia (AO type 42/43); standardized treatment concept: diaphysis: reamed intramedullary nailing; dia-metaphyseal junction and pilon: LCP with a minimal invasive approach or an open approach plus bone grafting from the iliac crest; infected nonunions: external fixator. Analysis parameters: demographic data, fracture type (AO classification), primary surgery, healing process, time to union (radiographic), complications.

Results: Forty-eight patients (39 m, 9 f; mean age 45,2 y) with 15 hypertrophic (primary surgery: 13x nail, 2x external fixator) and 33 atrophic nonunions of the tibia (primary surgery: 13x nail, 13x plate, 4x screws and 3x external fixator) were included in the study. Fifteen tibial nonunions had been primary treated in our department, 33 patients had been admitted from other hospitals. Seventy-three% of all nonunions were located at the distal third of the tibia (45% at the diaphyseal-metaphyseal junction, AO-classification type 42; 55% at the pilon, AO-classification type 43). Seventy-five% of the dia-metaphyseal fractures and 10% of the pilon fractures were primary treated with an intramedullary nail. The mean time between injury and nonunion-surgery was 10,3 (6-39) months. Follow up: 41/48 patients (85%) for an average time period of 22,2 months; union-rate: 37/41 (hypertrophic nonunions 11/13; atrophic nonunions 26/28; 2 re-nonunions each). Complications: 1 death by lung embolism, 1 re-nonunion (united after second surgery), 1 implant (plate) loosening with the need of re-osteosynthesis, 2x varus malalignment, 1x valgus malalignment, 1x peroneal nerve lesion.

Conclusion: Especially the distal third of the tibia still represents a high risk area for nonunions. Impaired perfusion, thin soft tissue coverage, as well as the rising number of nailing even of distal tibial fractures¹ are some of the causes. We think that the herein introduced treatment concept is effective to manage tibial nonunions. Thus, the union-rate in this study population was 90%^{2,3}. An adequate primary osteosynthesis as well as the prevention of extensive soft tissue damage during surgery are mandatory to improve the outcome of tibial fractures. Besides, new therapy options as e.g. the application of growth factors and ultrasound have to be considered also for the treatment of tibial nonunions.

References: 1) Vallier HA, J Orthop Trauma 2008 May-Jun; 22(5):307-11

2) Carpenter CA, Clin Orthop Relat Res 1996 Nov;(332):23-8

3) Richmond J, J Orthop Trauma 2004 Oct;18(9):603-10

Disclosure: No significant relationships.

PS052 Multiangular Locking Plates in the Treatment of High Energy Tibial Head Fractures – Clinical Results

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Introduction: High energy tibial head fractures with bicondylar involvement have a much poorer outcome compared to the other forms of tibial head fracture. Soft tissues are almost always compromised. Bilateral plating carries the risk of soft tissue and bone infections. Due to loss of reduction, steps or gaps might remain in the joint surfaces. Aim of this study was to evaluate the clinical and radiological outcome of Schatzker 4, 5 and six type fractures treated with locked osteosynthesis plating.

Material and Methods: Between January 2003 and January 2005 we treated 97 patients suffering from a tibial head fracture. In 26 cases osteosynthesis was performed with the use of an angular stable implant, this group forms the study population. Indication for locked screw plates were bicondylar fractures treated unilateral to avoid bilateral approach with double-plate osteosynthesis and tibial head fractures with a shaft involvement (Schatzker 6). Follow-up was performed after an average of 7.5 months after surgery. We treated 16 male and 10 female patients with an average of 52.5 years of age (17 to 73 years). There were no patients with open fractures or primary nerve injury included in this study. Operative treatment was performed after an average of 1.7 days after trauma. We used an angular stable plate fixator made from pure titanium (TiFix®, Litos, Hamburg/ Germany). The plate is consisting of the softer titanium Grade 1; the screws are made from harder titanium Grade 2.

Results: There was one case of a postoperative peroneal nerve lesion with spontaneous regression after two weeks. No postoperative wound necrosis or infection occurred. All patients showed bony consolidation after a mean of 8.4 weeks as judged by radiographs. Additional autologous bone transplantation was not necessary. We did not observe any secondary loss of reduction or loosening of the internal plate fixator when comparing direct postoperative radiographs to those at follow up. ROM of the knee did not show any restriction compared to the opposite side in 9 patients. 13 cases showed mild and 4 cases a remarkable restriction of ROM compared to the not injured side. Applying the Rasmussen score, 17 cases achieved a good and very good result. 6 patients had to be judged as moderate and 3 as poor

Conclusion: Unilateral plate fixation for the treatment of bicondylar tibial head fractures seems to offer advantages in particular concerning infection rate and implant failure in the treatment of tibial head fractures.

Disclosure: No significant relationships.

PS053 Compartment Syndrome After Proximal Metaphyseal Tibial Fractures

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Introduction: Compartment syndrome is one of the most frequent complications after proximal metaphyseal tibial fractures, due to the anatomical characteristics of this area. The importance of the problem is that the compartment syndrome radically changes the local and general and especially the type of fixation of the fracture. The purpose of this study is to evaluate the impact of the compartment syndrome on the outcome of the patients with this type of fracture, when recognized and treated early and complete.

Material and Methods: The authors analyse 52 cases of proximal metaphyseal tibial fractures treated in the Emergency Hospital, Bucharest, between 01.06.2004-01.06.2008. From these, in 28 cases, Compartment Syndrome was diagnosed. In all these cases, the patients were operated and the fracture stabilized (with plates and screws in 36 cases and external fixation in 16 cases). Decompressive fasciotomy was performed in all the 16 cases with installed compartment syndrome and intra-compartmental pressure was monitored post-operative in all the other 12 cases. From these, in 3 cases secondary Compartment syndrome developed and fasciotomy was necessary 24-48 hours after surgery. The patients are analysed concerning: the moment of surgical treatment, and the characteristics of the patient in that moment, post-operative treatment, the post-operative local and general outcome, local and general complications.

Results: The incidence of the complications was influenced by the time between trauma and complete surgery. There were 4 cases of superficial infection and 1 case of deep infection, without needing implant removal. All the fractures healed, the interval proved to be longer when external fixation was first used. There were no systemic definitive complications after these trauma.

Conclusion: Compartment syndrome is frequent after proximal metaphyseal tibial fractures and the incidence of this complication was significant in the group of patients we studied, and the outcome was good when the treatment was early and complete. The Compartment Syndrome influenced the local and general prognosis, due to the importance of microcirculation in healing after trauma.

References: McQueen MM. Acute compartment syndrome. *Acta Chir Belg* 1998 Aug;98(4):166-70 Compartment Syndrome in Lower limb Trauma - Gheorghe Ion Popescu, Olivera Lupescu, Mihail Nagea, Cristina Patru- Meteor Press, Bucharest, 2007.

Disclosure: No significant relationships.

PS054 Grade III Open Tibial Shaft Fractures – A Study of 43 Cases

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Introduction: Background: This study was conducted to determine the factors influencing fracture healing and risk for non-union in patients with grade III open tibial shaft fractures.

Material and Methods: Methods: Patients admitted to our level I trauma centre diagnosed with III° open tibial diaphyseal fracture

from April 1999 through June 2007 were included. Records were retrospectively analysed for injury mechanism, additional injuries, clinical course and complications as well as outcome.

Results: Mean age of the patients was 34.8 ± 16.7 years. According to the Gustilo classification 8 fractures were Type IIIA, 26 Type IIIB, 9 IIIC. In 36 patients the tibial shaft fracture was associated with multiple injuries with a mortality of 7% (n=3). In 8 patients (18.6%) an amputation was necessary ($p > 0.001$; OIIIA vs. OIIIB vs. OIIIC). A compartment syndrome was detected in 8 patients (18.6%; 2 OIIIA, 5 OIIIB, 1 OIIIC. A primary intramedullary nailing was conducted in 6 IIIA fractures, in 12 IIIB fractures and in 2 IIIC fractures. 12 patients (31.6%) showed primary fracture healing. Delayed union occurred in 6 cases (15.8%) while 11 patients (28.9%) showed a non-union. The average time to union of fractures was 97[60/283] (OIIIA=80d, OIIIB=147d, OIIIC=900d). Under patients showing infections - soft tissue infection was found in 16 patients (69.6%) while deep infections were found significantly more often in patients with OIIIB and OIIIC fractures ($p = 0.009$).

Conclusion: The severity of tibial diaphyseal fracture influences the development of complications e.g. infection and non-union.

Disclosure: No significant relationships.

PS055 Secondary Intra-Medullary Nailing After External Fixation for Open Tibia Fractures; A Solid Management?

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Introduction: Shaft fractures of tibia can usually be treated successfully by intra-medullary nailing. Nevertheless there are still limits in polytrauma patients and patients with open tibial shaft fractures. In these cases initially treatment with external fixation is indicated. The main complications of primary intra-medullary nailing occur early in the treatment course, whereas complications of external fixation are seen later in the treatment course. By two-stage treatment, one can take advantage of both treatment options. The (dis)advantages and the risk involved for open tibial fractures were investigated.

Material and Methods: A retrospective study, the group consisted of 11 consecutive patients above the age of 16 years. The study period was from January 2000 till January 2009 with a total of 12 open tibial shaft fractures. This was 6,6% of all tibial shaft fractures seen in this period. Average age was 32 years (range 16-50). They were all treated with external fixation followed by planned conversion to intra-medullary nail fixation. Data were analyzed using SPSS 16.0.

Results: There were 12 male patients with an average ISS of 14 (range 9-45). According to Gustilo and Anderson, two type I, three type II, and seven type III. The AO classification was, eight type A, three type B and one type C. All fractures of the tibial shaft were stabilized with an Orthofix®, within the first twenty-four hours after the injury. The mean duration of external fixation was 40 days. For 12 of the fractures, the external fixation was converted to intra-medullary nail fixation in a one-stage procedure. In the other fracture the Orthofix® was removed to allow pin-site healing before intra-medullary nailing. Follow-up averaged 11 months. Sixty-one percent healed within 12 months and eighty-five percent healed within 24 months. There were 5 major complications: two nonunions, one peroneal nerve injury, one osteomyelitis and one mal rotations of the tibia. The deep

infection rate was 8,3 percent. Seven other patients required minor additional operations.

Conclusion: We concluded that immediate external fixation followed by intra-medullary nailing is a safe treatment method for open tibial shaft or in polytrauma patients. The deep infection risk is with 8,3% acceptable in this study group. However the time to union is extended. The complications and re-operation rates of two-stage treatment of open tibial fractures are relatively high. This patient group requires special dedication on behalf of the trauma surgeon.

References: Yokoyama K, et al. Risk factors for deep infection in secondary intra-medullary nailing after external fixation for open tibial fractures. *Injury*. 2006 Jun;37(6):554-60. Malik ZU, et al. Planned external fixation to locked intramedullary nailing conversion for open fractures of shaft of femur and tibia. *J Coll Physicians Surg Pak*. 2005 Mar;15(3):133-6.

Disclosure: No significant relationships.

PS056 Metallic Pulmonary Embolus After an Open Fracture – A Previously Unreported Complication

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Introduction: Foreign body pulmonary emboli are rare events. To the best of our knowledge, this case report is the first example of a foreign body pulmonary embolus sustained from an open fracture wound.

Material and Methods: A 34 year-old man was admitted following a road traffic accident. The injury was an open Grade III-B right tibia fracture with an overlying wound measuring 25cm². The open fracture wound was extended, debrided and irrigated. The bone ends were delivered, curetted and irrigated. The fracture was directly reduced and fixed with an intramedullary tibial nail, utilising the principle of relative stability. On day 3 post admission, he became dyspnoeic and tachypnoeic with a drop in oxygen saturation.

Results: A CT pulmonary angiogram illustrated a metallic density, which appeared to lie in the lumen of the main pulmonary artery just proximal to the pulmonary valve.

Conclusion: In this case, the respiratory symptoms and signs were due to a metallic pulmonary embolus rather than fat or thrombus. Formal anticoagulation was initiated and the patient's clinical condition consistently improved without the need for cardiothoracic surgery, although this is described in the literature with retained catheter fragments. Eight months after the injury, the fracture has consolidated with the patient returning to work.

Disclosure: No significant relationships.

UPPER EXTREMITY

PM001 Early Results of Proximal Humeral Fracture Treatment Using the Philos Plate

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Introduction: Every patient with the proximal humeral fracture assessed at the our department is advised according to the AO/ASIF classification scheme. Various types of surgical treatment could be indicated in respect of the fracture morphology and patient's health status. Type of fracture, age and general condition of patient, biomechanic behaviour and cost of implant, along with the surgeon's experience must be taken into account when choosing the most appropriate implant. We routinely use fixed angle plates in A2, A3, B2, B3 and C3 types of proximal humeral fractures. For some other types with metaphyseal comminution and metaphyseal-diaphyseal junction fractures (A2, B2,3), proximal humeral nail (PHN) seems to be the right implant with satisfactory results. B1, B2 and C1, C2 fractures are preferred to be treated percutaneously.

Material and Methods: During the last 3 years 275 patients with the proximal humeral fracture were treated at our department. 32 patients were treated with Philos plate, 27 patients with percutaneous pinning or proximal humeral nail and 216 patients has received conservative treatment. We have performed a retrospective and prospective analysis of 32 consecutive patients between January 2006 and December 2008 treated with Philos plate osteosynthesis. The average age was 57 years (22-68) in 19 female and 13 male patients. According to the AO classification we have included 14 patients with A2, A3 fracture, 13 patients with B2, B3 and five with type C3. Two patients had a combination of C3 type and glenoid fracture.

Results: Every patient was assessed by Constant-Murley score during the follow up at 6 months post surgery. The overall mean Constant score was 85 in A2, A3 types, 81 in the group with B1, B2 and 63 in the C3 group.

There were no determined complications in A2, A3 group. Shoulder impingement has developed in one patient after B2 fracture. In group with C3 fractures there was one complication of deep infection, successfully treated with antibiotics and evacuation. Avascular necrosis of humeral head has later developed in two patients and as a treatment option we've performed hemiarthroplasty and total shoulder arthroplasty in the other one.

Conclusion: Philos plate osteosynthesis is a reliable method of treatment in A2,3, B2,3 proximal humeral fractures. Despite the individual treatment concept, C3 type fractures remain problematic and the result is often disappointing with a relatively high complication rate. Primary shoulder hemiarthroplasty or total arthroplasty performed in C3 fractures is like to be the only successful method of surgical treatment.

Disclosure: No significant relationships.

PM002 Minimal Invasive Plate Osteosynthesis for Proximal Humeral Fractures: Technique and Early Results

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Introduction: The standard approach to treat proximal humeral fractures with plate osteosynthesis is the deltopectoral one. However with this approach the anterior circumflex artery is at risk and devascularization of the fracture fragments can result. Furthermore the approach is an indirect one and extensive distraction of the del-

toid is often necessary to obtain adequate exposure. As an alternative to this we promote the minimal invasive transdeltoid approach.

Material and Methods: The operative technique of the minimal invasive transdeltoid approach is explained in a first section. This approach has the advantage of direct access to the fracture site with more opportunities for adequate reduction and good plate placement without extensive distraction of the muscles. An important step in the procedure is the palpation of the axillary nerve.

In a second section the results of a prospective cohort of the first 14 patients treated with this technique will be presented. The Neer criteria were used as guidelines for operative treatment. Fractures were classified according to the AO-classification. The ASSES shoulder score was used to evaluate functional outcomes. Preoperative x-rays were used to evaluate displacement, vascularity of the humeral head (according to the Hertel criteria) and AO fracture type. Post-operative X-rays were analyzed for quality of reduction of the CCD angle, reconstruction of the medial hinge and reposition of the tuberosities. Follow-up X-rays were evaluated for healing, avascular necrosis, loss of reduction and implant related failures of osteosynthesis.

Results: The 14 patients treated with this technique had an average age of 66.6 years. Fracture types were AO type A in one case, type B in 2 cases and type C in the remaining 11 cases. Cumulative displacement of the shaft and tuberosities averaged 26.5 mm pre-operative with an improvement to 8.4 mm postoperative. No early loss of reduction leading to revision was noted in the 6 months follow-up. There were no axillary nerve palsies. Mean cumulative displacement in our cohort of 122 patients treated with the deltopectoral approach was 24.0 mm pre-operative with a mean improvement to 12.3 mm post-operative. Functional results between these 2 groups did not show significant differences.

Conclusion: Minimal invasive plate osteosynthesis for the treatment of proximal humeral fractures is a relative new but safe and promising technique, with easier and more accurate reduction of the fracture and easier plate and screw placement.

Disclosure: S. Nijs has provided consultancy services to Synthes

PM003 Hemiarthroplasty with Long Stem Prosthesis in Destroying Proximal Humeral Fracture

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Introduction: Hemiarthroplasty is indicated for complex proximal humeral fractures in elderly patients with poor bone stock or when internal fixation is difficult or unreliable. In the presented case the surgical reconstruction of the proximal humerus was hopeless.

Material and Methods: Case report

Results: The 67-year-old male patient was taken to hospital after a traffic accident. He was a pedestrian hit by a car. He suffered comminuted proximal humeral fracture on the dominant right side. The fracture was closed. The glenoid cavity was damaged and acromion was broken. The fractures of the V-VIth ribs were found without complication. Otherwise the patient's condition was good. He had only a controlled hypertension. For preoperative planning CT scan was performed. As pieces of the humeral metaphysis wedged into the glenoid cavity insertion of glenoid component seemed uncertain. An

early shoulder replacement was done on the 7th day. The denuded fragments were removed. The tubercles with the muscle attachments were preserved. As a long bone defect remained in the metaphyseal zone normal stem would have been insufficient. A 220 cm long stem used in tumor cases was implanted. The length of the arm and size of the humeral head were compared to the intact side. The tubercles were attached to the prosthesis by non absorbable sutures. After the operation long bone defect remained which was filled up by heterotopic bone visible on X-ray. The postoperative period was complication free. Fever, severe pain, hematoma did not occur. The arm was in rest for 6 weeks, only controlled pendulum exercises were done from the second week. Active physiotherapy was started on the 7th week. After 5 months the patient finished the follow up treatment. He was pain free and self-sufficient.

Conclusion: For three- or four-part displaced fractures in which replacement is indicated, hemiarthroplasty with tuberosity reattachment remains the reference treatment^{1,2/}. In trauma cases short prosthesis stem is usually sufficient but in comminuted fractures involving the metaphyseal zone long stem has to be used for certain bone-prosthesis contact.

References: 1. Gallinet D, Clappaz P, Garbuio P, Tropet Y, Obert L.: Three or four parts complex proximal humerus fractures: hemiarthroplasty versus reverse prosthesis: a comparative study of 40 cases. *Orthop Traumatol Surg Res.* 2009 Feb;95(1):48-55. Epub 2009 Feb 6. 2. Nijs S, Broos P.: Outcome of shoulder hemiarthroplasty in acute proximal humeral fractures: a frustrating meta-analysis experience. *Acta Orthop Belg.* 2009 Aug;75(4):445-51.

Disclosure: No significant relationships.

PM004 Reversed Fracture Arthroplasty

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Introduction: Fracture arthroplasty remains a valid treatment for complex fractures of the proximal humerus in the elderly. However functional results depend on healing of the tuberosities. Advanced prosthetic design and optimized techniques of tuberosity fixation results in increased healing rates, but nevertheless in 1 out of 4 patients anatomical healing of the tuberosities is not achieved. Reversed arthroplasty can be used to treat different pathologies that can be summarized as rotator cuff insufficient shoulders. Some reports on the use of reversed prostheses in the treatment of proximal humeral fractures exist. The most common problem is that reattachment of the tuberosities is difficult and healing is seldom achieved. We describe the use of and outcome of reversed prosthesis specifically designed for the treatment of proximal humeral fractures.

Material and Methods: We prospectively documented the outcome of reversed shoulder arthroplasty for acute fractures using the Affinis Inverse Fracture System (Mathys Ltd, Betlach, Switzerland) and report the 1 year result. Indications for primary reversed arthroplasty were: a pre-existing large to massive rotator cuff tear, comminuted tuberosities, female gender and age over 75. Outcome measures are: range of motion, pain, strength, Constant score and complications including notching. Physical examination has been performed by an

independent investigator. Results have been compared to a historical series of patients treated by hemiarthroplasty.

Results: On average the patients treated by reversed arthroplasty are 7,5 years older than those treated by hemiarthroplasty. The average Constant score in the reversed group is 61,5 against 59,5 in the hemigroup. This difference is statistically not significant. There is a better elevation and abduction in the reversed group. Strength is better in the hemigroup. No other statistical significant differences could be demonstrated. In the reversed group there was 1 infection, 1 fracture of the collar bone and 1 fracture of the coracoid process. In the hemigroup there was 1 infection, 1 periprosthetic fracture, and two loosening of the tuberosities needing revision with a reversed prosthesis.

Conclusion: Reversed arthroplasty results in comparable results as hemiarthroplasty, but in patients being on average 7,5 years older with a similar complication rate as in hemiarthroplasty.

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PM005 The Problems of Early Surgical Treatment of Periprosthetic Humeral Fractures

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Introduction: With an overall incidence of between 0,5% and 3% there is less experience in dealing with such cases. Our aim was to analyze the complications associated with early surgical treatment of periprosthetic type-B humeral fractures.

Material and Methods: We classified the periprosthetic fractures according to the system proposed by Wright and Cofield in 1995.¹ Type-A fractures are located at the tip of the prosthesis and extend proximally, type-B fractures lie at the tip of the prosthesis without extension or with minimal extension proximally and variable extension distally, and type-C fractures occur distal to the implant and extend into the distal humeral metaphysis.

Results: The average time from arthroplasty to the fracture was 45,5 months (range, 12 to 48 months). The fracture united in four patients. Pseudoarthrosis was detected in one patient. The average active shoulder abduction was 26° (range, 10° to 45°) and the average external rotation was 14° (range, 5° to 20°) at the last follow-up examination. In three patients with a well-fixed humeral component, open reduction and internal fixation with the use of a plate and screws was performed. Two patients with a Delta prosthesis had an unstable humeral component. In one patient a proximal humeral resection and an implantation of an HMRS prosthesis was performed. The other patient received a delta revision stem prosthesis, cable and plate fixation.

Conclusion: The main problems were postoperative radial nerve palsy, non-union, deterioration of shoulder function, and constant pain. The management in some type-B fractures with transverse or short oblique fracture-lines which are difficult to align, even with a well-fixed humeral component is the main endeavour. If surgical treatment is considered, especially in type-B fractures with a loose prosthesis, a replacement with a revision long-stem component and additionally a plate fixation (LCP) and bicortical and unicortical screws (with or) without cable wiring should be used to obtain secure fixation. In type-B fractures with a stable implant the use of limited compression interlocking plate (LCP) combined with a bone autograft in order to maximize the healing potential and additional cer-

clage fixation in the proximal and distal fragment if necessary should be considered.^{3,4}

References: 1. Wright TW, Cofield RH. Humeral fractures after shoulder arthroplasty. *J Bone Joint Surg Am.* 1995;77:1340-6. 2. Worland RL, Kim DY, Arredondo J. Periprosthetic humeral fractures: management and classification. *J Shoulder Elbow Surg.* 1999;8:590-4. 3. De Smet L, Debeer P, Degreef I. Fixation of a periprosthetic humeral fracture with CCG-cable system. *Acta Chir Belg.* 2005;105(5):543-4. 4. Kent ME, Sinopidis C, Brown DJ, Frostick SP. The locking compression plate in periprosthetic humeral fractures A review of two cases. *Injury.* 2005.; 36(10):1241-5. Epub 2005 Jun 27.

Disclosure: No significant relationships.

PM006 Surgical Versus Non-Surgical Treatment for Humeral Shaft Fractures in Adults – A Review

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Introduction: Fractures of the shaft of the humerus account for 1-3% of all fractures. The prevalence of osteoporotic humeral shaft fractures is rising. Discussion persists about the therapeutic options. Some authors promote conservative treatment as standard treatment whereas others only use conservative treatment in the minority of cases. To our knowledge there is no recent review that focuses on the operative versus non-operative treatment for humeral shaft fractures in adults.

Material and Methods: We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register, the Cochrane Central Register of Controlled Trials, MEDLINE and EMBASE (OvidSP) for publications that compare surgical versus non-surgical treatment for humeral shaft fractures in adults. We also searched in internationally recognised trial databases for ongoing and recently completed trials. Two independent researchers assessed the quality of the publications in accordance to the Cochrane Handbook. Only randomized controlled trials were included.

Results: We found 4 publications that compared surgical versus non-surgical treatment for humeral shaft fractures in adults. Three retrospective studies and one prospective study without randomization. No randomized controlled trial was identified. Complications of operative treatment are infections 0%-7%, pseudarthrosis 3%, shoulder pain 18,5%, impingement 27% (Seidel nail) and radial nerve palsy 7-10%. 80% of the patients had no reduction in function. Complications of conservative treatment are pseudarthrosis 8%, secondary displacement 25% (surgery needed). 90% of the patients had no reduction in function 90%.

Conclusion: A meta-analysis is not possible because of the absence of controlled randomized trials. The available literature is heterogenic and does not allow a valid conclusion in favor of surgical or non-surgical treatment for humeral shaft fractures in adults. A large randomized controlled trial with well described indications for inclusion is needed for a better evidence based care for adults with humeral shaft fractures.

References: Klestil T, Rangger C, Kathrein A, Brenner E, Beck E. The conservative and surgical therapy of traumatic humeral shaft fractures. *Chirurg* 1997;68(11):1132-6. Nast-Kolb D, Knoefel WT, Schweiberer L. The treatment of humeral shaft fractures. Results of a prospective AO multicenter study. *Unfallchirurg* 1991; 94(9):447-54. Osman N, Touam C, Masmejean E, Asfazadourian H, Alnot JY. Results of non-operative and operative treatment of humeral shaft fractures. A series of 104 cases. *Chirurgie de la Main* 1998;17(3):195-206. Wallny T, Sagebiel C, Westerman K, Wagner UA, Reimer M. Comparative results of bracing and interlocking nailing in the treatment of humeral shaft fractures. *International Orthopaedics* 1997; 21(6):374-9.

Disclosure: No significant relationships.

PM007 Lateral Entry Fixation Using Three Divergent Pins for Displaced Paediatric Supracondylar Fractures

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Introduction: Supracondylar fractures are the commonest elbow injury in children. There are numerous debated methods of treatment in the literature. Most displaced supracondylar fractures are manipulated closed and held with a medial / lateral entry or two lateral Kirschner wires. The aim is to prevent the reduction slipping (causing cosmetic deformity and functional restriction) and iatrogenic nerve injury. This clinical study has results purely from a three lateral divergent wire technique.

Material and Methods: Under a general anaesthetic displaced supracondylar fractures were manipulated closed and three lateral divergent wires inserted. Note was made of pre-operative neurovascular compromise and any iatrogenic nerve injuries. Primary study end points were range of movement and carrying angle relative to the contralateral uninjured elbow (Flynn's grading system) and presence of iatrogenic nerve injury.

Results: 25 children between 3 and 10 years (median 5, range 3-10) suffered a displaced fracture (15 type III, 10 type IIB). 15 left, 10 right sided fractures. 14 boys and 11 girls. 23 were fixed primarily, of these 21 in the first 24 hours. 2 were delayed due to swelling. 2 were fixed secondarily with lateral k-wires after loss of position and had been fixed primarily with crossed wire technique by other consultants. One radial and one median nerve injury sustained at injury settled. No iatrogenic nerve injuries occurred. 21 Excellent, 3 good and 1 poor result on Flynn's grading.

Conclusion: The use of three wires on the lateral side is a safe method for improving fracture stability and decreasing iatrogenic nerve injury.

References: Skaggs D, Pershad J. Pediatric elbow trauma. *Pediatr Emerg Care*. 1997; 13:425-434. Brauer CA, Lee BM, Bae DS et al. A systematic review of medial and lateral entry pinning versus lateral entry pinning for supracondylar fractures of the humerus. *J Pediatr Orthop*. 2007; 27:181-6. Gartland JJ. Management of Supracondylar fractures of the humerus in children. *Surg Gynecol Obstet*. 1959; 109:145-154. Skaggs DL, Hale JM, Bassett J, et al. Operative treatment of supracondylar fractures of the humerus in children. The consequences of pin placement. *J Bone Joint Surg Am*. 2001; 83:735-

40. Lee SS, Mahar AT, Miesen D et al. Displaced pediatric supracondylar humerus fractures: biomechanical analysis of percutaneous pinning techniques. *J Pediatr Orthop*. 2002; 22:440-3. Flynn JC, Matthews JG, Benoit RL et al. Blind pinning of displaced supracondylar fractures of the humerus in children. Comparison of operative treatment methods. *Clin Orthop Relat Res*. 2000; 376:49-55. Kocher MS, Kasser JR, Waters PM et al. Lateral entry compared with medial and lateral entry pin fixation for completely displaced supracondylar fractures in children. A randomised clinical trial. *J Bone Joint Surg Am*. 2007; 89:706-712.

Disclosure: No significant relationships.

PM008 An Erroneous Diagnosis of an Open Fracture with Bone Loss: A Cautionary Tale

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Introduction: A thorough secondary survey following ATLS principles is always needed to plan surgical intervention in the multiply injured patient. We report a case that highlights this need and identifies the potential problem of relying on the assessment performed by other professionals.

Material and Methods: Case report: A 34 year old attempted suicide by jumping from a 10-metre bridge and presented to the emergency department with multiple injuries, including an open distal humerus fracture with a 60mm wound overlying the fracture site. Paramedics presented a 70 x 18mm segment of bone found at the scene to the trauma team. X-rays showed metaphyseal fragmentation and indicated a segment of bone loss. Wound debridement and temporary external fixation was carried out. Care of the patient was subsequently taken over by the limb reconstruction team but at the second wound exploration and debridement bone loss was not readily apparent. Subsequent analysis to identify the bone segment revealed that it was not human and was likely to be porcine tibial shaft.

Results: The segment of animal bone found at the scene and degree of fragmentation on x-ray led to an erroneous diagnosis of an open fracture with bone loss. A more thorough assessment would have identified that clinical and radiological signs did not support this diagnosis. A better understanding of the injury pattern would have helped plan definitive surgical fixation.

Conclusion: Bone fragments brought with a patient do not always indicate an open fracture with bone loss. A meticulous secondary survey of the traumatised patient is needed before planning surgical treatment.

Disclosure: No significant relationships.

PM009 An Original Locking Plate System for Complex Fractures of the Distal Humerus

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Introduction: The purpose of this study was to evaluate a new ONI Elbow Plate System for complex fractures of the distal humerus.

Material and Methods: Twenty-two patients with displaced multi-fragmentary fractures of the distal humerus were treated by our new fixation system. Group I (13 young adult patients, mean age

27.1 years, range 16 to 52 years), fracture type AO C1: 7 cases, C2: 5 cases, C3: 1 case. Group II (9 elder patients, mean age 77.0 years, range 70 to 88 years), fracture type AO C1: 5 cases, C2: 3 cases, C3: 1 case. The ONI transcondylar plate conforms to the anatomical contour of the lateral column of the distal humerus and a locking mechanism between the plate portion and the transcondylar screw and the ONI medial plate conforms to the anatomical contour of the medial one. All of the fractures were fixed by an ONI plate and the transcondylar screw which passed from the lateral epicondyle to the medial wall of the trochlea across the humeral condyle. We used the ONI plate at the lateral side of the fracture site in all cases, and either a cannulated cancellous screw (n=8) or an AO one-third tubular plate (n=9) or the ONI medial plate (n=5) at the medial side of the fracture site. The mean period of follow up was 32 months (24 to 48 months).

Results: In all of the 22 cases, complete union was seen on radiographs, and alignment was almost maintained postoperatively. The assessment of results according to the modified Cassebaum's rating score was 94.6 in Group I and 90.4 in Group II. There were no cases of nonunion or malunion.

Conclusion: Our data showed that the ONI elbow system for treatment of complex fractures of the distal humerus produced consistently good results even in cases with a small osteoporotic fragment of the distal humerus.

Disclosure: No significant relationships.

PM010 Instability After Open Reduction and Internal Fixation of the Distal Humerus

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Introduction: There is a trend to apply plate and screw fixation directly medial and lateral (so-called parallel plating), and many implants designed specifically for the distal humerus extend more laterally to improve fixation. This may risk injury to the origins of the common extensor and flexion musculature and the collateral ligaments either via operative dissection or by damage to the blood supply. Internal plate and screw fixation is often accomplished with subperiosteal elevation of muscle attachments and tight apposition of the plate to the bone, but this should not be done over the epicondyles. Plates applied to the medial and lateral aspects of the lateral and medial epicondyles should be placed directly over the soft tissues without elevating or disturbing them. Damage to the collateral ligaments could cause elbow instability.

Material and Methods: In order to emphasize these important technical aspects, we report three patients in whom detachment of the origins of the lateral collateral ligament and common extensor muscle origins from the lateral epicondyle led to post-operative instability after open reduction and internal fixation of a fracture of the distal humerus.

Results: While the cases are very complex and the exact cause of elbow instability by necessity somewhat speculative, our concern is that the operative dissection performed to apply implants to the lateral side of the elbow contributed to the ulnohumeral instability. Injury to the LCL is the most common cause of recurrent elbow dislocation. Attempts to place a direct lateral implant directly on the bone by elevating soft tissues will put the origin of the LCL at risk. It is preferable to place implants directly over the soft tissues, although there is a risk of interfering with blood supply leading to soft tissue insufficiency. It seems safe to assume that the operative treatment contributed in some way to the instability in each patient. Patient one in particular had osteoporotic bone noted intraoperatively, so that one would expect failure to occur through bone with any subsequent trauma. The failure through the ligamentous structures seems to implicate the operative technique.

Conclusion: In any case, these three patients establish that instability of the ulnohumeral joint is an uncommon complication or sequel of the operative treatment of a bicolunar fracture of the distal humerus. Our intention in reporting these cases is to increase awareness of these potential complications and we encourage others to report any similar cases so that we can learn enough to limit the risk of this complication.

References: 1.O'Driscoll SW. Optimizing stability in distal humeral fracture fixation. *J Shoulder Elbow Surg.* 2005;14(1 Suppl S):186S-94S. 2.O'Driscoll SW, Sanchez-Sotelo J, Torchia ME. Management of the smashed distal humerus. *Orthop Clin North Am.* 2002;33(1):19-33, vii. 3.Sanchez-Sotelo J, Torchia ME, O'Driscoll S W. Principle-based internal fixation of distal humerus fractures. *Tech Hand Up Extrem Surg.* 2001;5(4):179-87. 4.Sanchez-Sotelo J, Torchia ME, O'Driscoll SW. Complex distal humeral fractures: internal fixation with a principle-based parallel-plate technique. *J Bone Joint Surg Am.* 2007;89(5):961-9. 5.Sanchez-Sotelo J, Torchia ME, O'Driscoll SW. Complex distal humeral fractures: internal fixation with a principle-based parallel-plate technique. *Surgical technique. J Bone Joint Surg Am.* 2008;90 Suppl 2 Pt 1:31-46. 6.Cohen MS, Hastings H, 2nd. Rotatory instability of the elbow. The anatomy and role of the lateral stabilizers. *J Bone Joint Surg Am.* 1997;79(2):225-33. 7.O'Driscoll SW, Bell DF, Morrey BF. Posterolateral rotatory instability of the elbow. *J Bone Joint Surg Am.* 1991;73(3):440-6. 8.Osborne G, Cotterill P. Recurrent dislocation of the elbow. *J Bone Joint Surg Br.* 1966;48(2):340-6.

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PM011 Treatment of the Complex Intraarticular Fracture of the Distal Humerus with the Latitude-Elbow-Prosthesis – A Retrospective Study with Complication Analysis

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Introduction: ORIF of comminuted distal humerus fractures carries a high risk of complications such as secondary loss of reduction, pseudarthrosis and heterotopic ossifications. Especially elderly patients with osteoporotic bone quality are struck by these complications. Therefore total elbow arthroplasty (TEA) is gaining more and more in importance as it has proven to achieve good results in elderly patients with poor bone quality. The Latitude total elbow system (Tornier Inc., Stafford, USA) is a modular, convertible implant that allows not only linked and unlinked TEA with or without radial head replacement but also hemiarthroplasty. The aim of this system is to reproduce the patient's anatomy to reconstitute the elbow's physiologic kinematics. Therefore the Latitude prosthesis is offered in four different sizes, respecting the flexion-extension axis and three different humeral offsets based on anatomical findings. The purpose of our study was to evaluate the short-term results after elbow arthroplasty with the Latitude system.

Material and Methods: 17 Latitude elbow prostheses (Tornier) were implanted 2007 and 2008 in our Department of Trauma Surgery due to the following indications: fracture (n=9), pseudarthrosis (n=4), posttraumatic arthritis (n=3), and rheumatoid arthritis (n=1). 2 unlinked and 8 linked prostheses and 7 hemiprostheses, were implanted. The mean age of patients was 67 years (31-88 years). For the treatment of acute fractures the indication was made only in elderly patients. The mean age was 77 years (66-88).

Results: These patients were reexamined after 13.5 months (6-23 months). The mean extension deficit was 22 degrees (0-30), the mean flexion 126 degrees (95-140). The mean pronation was 78 degrees (60-90), the mean supination 79 degrees (50-90). The mean Mayo-Score was 89.23 (74-100). All patients reached good and excellent results except one who reached a fair result. The mean DASH-Score was 8.43 (0-28). Complications: one humeral fissure, one ulnar nerve irritation, one haematoma that required a revision, two cases of triceps insufficiency and one case of flexion deficit due to a coronoid osteophyte. In one case a secondary radial head resection had to be performed. One early wound infection could be managed with debridement. No prosthesis had to be explanted. Radiographs did not show any evidence of loosening.

Conclusion: Our short-term results show that the aim of a painfree and stable elbow can be reached with elbow arthroplasty. Results were mostly good to excellent in our patients according to the Mayo- and DASH-Score.

Disclosure: No significant relationships.

PM012 Prosthetic Replacement After Elbow Injury

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Introduction: Severe multi fragmental fractures of distal part of the shoulder. can cause upper extremity dysfunction and disability.

Material and Methods: 8 patients aged 22-58 with elbow trauma and its effects underwent endoprosthetic replacement in time period of 1 month up to 4 years after injury. Effects of severe multi fragmental humerus condyle fractures were indications for treatment. Before replacement two patients received conservative treatment (reposition of displacement, plaster splint). One open fracture was managed by surgical debridement with external fixation. In two cases pin and plate osteosynthesis was applied inappropriately; the treatment was effected by repeat dislocation of fragments and elbow contracture.

Two cases involved additional pin and K-wire fixation of the lateral epicondyle, which required two weeks immobilization of the upper extremity.

Results: 7 patients were assessed at long term - from six months to 5 years-follow-up. We obtained good results in seven cases. Only one patient with a 4 year old injury reported satisfactory results, complaining at a moderate pain under physical activity and poor movement amplitude.

Conclusion: The study demonstrates the value of endoprosthetic elbow replacement in providing recovery of upper limb function in case of severe injury of the distal part of the shoulder.

Disclosure: No significant relationships.

PM013 Complex Fractures of the Proximal Radius: Prosthesis or Resection – A Systematic Review of the Literature

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Introduction: It is not always possible to reconstruct complex radial head fractures. As non-anatomical reconstruction and healing disturbances result in loss of motion and severe post-traumatic arthritis of the elbow joint, radial head resection has been proposed for these cases. Other authors propose radial head arthroplasty as an alternative to radial head resection to avoid the complications of radial head resection. Different concepts of radial head prostheses are available: silicon prosthesis, monopolar prosthesis (loose fit and cemented/tight fit) and bipolar prostheses. Evidence is lacking on the exact place for arthroplasty as opposed to radial head resection. To answer this question we performed a systematic review of literature.

Material and Methods: Inclusion criteria are clinical studies reporting on radial head resection or radial head arthroplasty, published between 1995 and today in english, french, german or dutch language. A search has been performed using the Pubmed and Embase databank. A secondary search has been performed based upon the reference list of the included publications. Exclusion criteria are: â€¢cadaver or animal studies â€¢biomechanic studies â€¢clinical studies with a follow up of less than 2 years â€¢clinical studies with less than 10 patients Data extraction â€¢elbow function â€¢complication rate â€¢arthritis rate Data are reported according to the MOOSE guidelines.

Results: Only low evidence studies are available. We did not find any randomised controlled trial comparing resection to radial head arthroplasty. There is evidence that radial head resection results in high complication rates (including arthritis) and poor function in case of elbow instability and/or Essex-Lopresti lesions. The rate of complications in these indications is higher than for radial head arthroplasty. In cases without instability or Essex-Lopresti lesion there is a trend to better function in radial head resection. Complication rate is higher in the prosthesis patients. The rate of post-traumatic arthritis is not significantly differing between the resection and the arthroplasty group, and remains very high (+/- 70%).

Conclusion: Complex radial head fractures remain difficult to treat. Based upon the findings of this systematic review we suggest: â€¢that adequate level of evidence studies are a necessity â€¢that in case of fracture without evident instability or Essex-Lopresti lesion resection results in better function and less complications than arthroplasty

that in case of fracture with evident instability or Essex Lopresti lesion resection results in worse function and higher complication rates than arthroplasty. As secondary arthritis rate remains 70%, further therapeutic optimisation is a must.

Disclosure: No significant relationships.

PM014 Anterior Interosseus Nerve Paralysis After Radial Head Osteosynthesis: 2 Case Reports

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Introduction: Radial head fractures are the most common fractures occurring around the elbow, associated fractures and ligament injuries are common. Traumatic lesions of peripheral nerves represent a rare type of complications in radial head fractures. In acute fractures spontaneous neurological remission usually occurs after reduction of the dislocated radial head.

Material and Methods: We report two cases of neurological deficiency of anterior interosseus nerve, branch of median nerve, in two women after open reduction and internal fixation of radial head. This operation was performed in our hospital during year 2008 with an interval of two months by two different surgeons. The initial Injury was a dislocated fracture of radial head. At clinical examination before operation the patients didn't have any neurological deficit. Post-surgery recovery showed palsy of the anterior interosseus nerve in the two patients. In both cases EMG and ENG were performed and confirmed specific block of conduction of the 2 nerves.

Results: Conservative treatment including intensive physiotherapy and electrotherapy for three months was successful. Full neurological recovery was obtained after 3 months for one patient and after 6 months for the other.

Conclusion: Anterior Interosseus nerve injury is a very rare complication after radial head surgery. In the literature we found 2 similar reports (4 cases). In our cases, this complication is due probably to a soft tissue distraction during operation. therefore It is very important to treat tissues around the bone with gentle handling, never forget to use proper tissue distractor.

References: Hope PG. Anterior interosseous nerve palsy following internal fixation of the proximal radius. *J Bone Joint Surg Br.* 1988 Mar;70(2):280-2. Zilch H. Isolated paralysis of the long flexor muscle of the thumb following osteosynthesis of the radius. The anterior interosseus nerve syndrome. *Unfallheilkunde.* 1983 Sep;86(9):407-10.

Disclosure: No significant relationships.

PM015 Non-Operatively Treated Fractures of the Anteromedial Facet of the Coronoid Process

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Introduction: This report describes the non-operative treatment of six patients with fracture of the anteromedial facet of the coronoid process.

Material and Methods: We identified and reviewed the medical records of six patients with a non-operatively treated O'Driscoll Type II anteromedial facet fracture of the coronoid. Clinical outcome was evaluated using the Broberg and Morrey rating system. Three patients that returned for a medium long-term research specific follow-up were also evaluated with the ASES Self-Report Form, DASH Outcome Measure and the MEPI.

Results: All three patients that returned for follow-up regained full or near full elbow flexion and full or near full forearm rotation. Two patients had a MEPI score of 100 points, one patient scored 40 points. According to the MEPI classification system there were 2 excellent (66.6%) and 1 poor (33.3%). According to the Broberg and Morrey system all patients had an excellent result. Two patients scored 100 points on the ASES score, and one patient scored 56 points. The DASH scores were 0 points, 2.5 points and 49.1 points respectively.

Conclusion: Anteromedial facet fractures can be very subtle injuries, and we recommend careful evaluation and management. Non-operative treatment can be considered if subluxation is ruled out and the fracture is small and minimally, which may be most reliably documented using sophisticated imaging such as computed tomography with three-dimensional reconstructions.

References: 1.Doorberg JN, de Jong IM, Lindenhovius ALC, Ring D. The anteromedial facet of the coronoid process of the ulna. *J Shoulder Elbow Surg.* 2007;16(5):667-70. 2.Doorberg JN, Ring D. Coronoid fracture patterns. *J Hand Surg Am.* 2006;31A(1):45-52. 3.Doorberg JN, Ring DC. Fracture of the anteromedial facet of the coronoid process. *J Bone Joint Surg Am.* 2006;88A(10):2216-24. 4.O'Driscoll SW, Jupiter JB, Cohen MS, Ring D, McKee MD. Difficult elbow fractures; pearls and pitfalls. *Instr Course Lect.* 2003;52:113-34. 5.Ring D, Doorberg JN. Fracture of the anteromedial facet of the coronoid process. Surgical technique. *J Bone Joint Surg Am.* 2007;89(2):267-83. 6.Broberg MA, Morrey BF. Results of Delayed Excision of the Radial Head After Fracture. *J Bone Joint Surg Am.* 1986;68A(5):669-74. 7.King GJW, Richards RR, Zuckerman JD, Blasler R, Dillman C, Friedman RJ, et al. A standardized method for assessment of elbow function. *J Shoulder Elbow Surg.* 1999;8(4):351-4. 8.Solway S BD, McConnell S, Bombardier C. The DASH Outcome measure user's manual (2nd edition). Toronto: Institute for Work & Health; 2002. 9.Broberg MA, Morrey BF. Results of Treatment of Fracture-Dislocations of the Elbow. *Clin Orthop Relat Res.* 1987(216):109-19. 10.Wells J, Ablove RH. Coronoid fractures of the Elbow. *Clin Med Res.* 2008;6(1):40-4. 11.O'Driscoll S. Coronoid fractures. In: Norris TR, editor. *Orthopaedic Knowledge Update: Shoulder and Elbow* 2. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2002. p. 379-84. 12.O'Driscoll SW. Acute, recurrent & chronic elbow instabilities. In: Norris TR, editor. *Orthopaedic Knowledge Update: Shoulder and Elbow* 2. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2002. p. 313-23.

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PM016 Is Early Computed Tomography a Reliable Alternative for Bone Scintigraphy in Suspected Scaphoid Fractures

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Introduction: We investigated if Computed Tomography (CT) is more accurate than bone scintigraphy for diagnosis of an occult scaphoid fracture.

Material and Methods: In a study period of one year, one hundred consecutive patients with a suspected scaphoid fracture but no fracture on scaphoid radiographs were evaluated with CT within 24 hours of injury and bone scintigraphy between three to five days after injury. The reference standard for a true (radiographic occult) scaphoid fracture was either 1) diagnosis of fracture on both CT and bone scintigraphy, or 2) in case of discrepancy, clinical and/or radiographic evidence of a fracture.

Results: CT showed 10 scaphoid and 18 other fractures. Bone scintigraphy showed 21 scaphoid and 36 other fractures. According to the reference standard there were 14 scaphoid fractures. CT had a sensitivity of 64%, specificity of 99%, accuracy of 94%, a positive predictive value (PPV) of 90% and a negative predictive value (NPV) of 94%. Bone scintigraphy had a sensitivity of 93%, specificity of 91%, accuracy of 91%, a positive predictive value of 62% and a negative predictive value of 99%.

Conclusion: This study could not confirm that early CT imaging is superior to bone scintigraphy for suspected scaphoid fractures. The use of bone scintigraphy for triage of suspected scaphoid fractures might lead to substantial overtreatment. CT is more accurate but risks undertreatment of 36% of patients.

Disclosure: No significant relationships.

PM017 Carpal Dislocations and Fracture Dislocations: Study of Treatment and Follow up Results

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Introduction: Studying the functional results in patients with severe carpal dislocations and fracture-dislocations and his correlation with type of injury and the treatment they received.

Material and Methods: Were identified retrospectively 25 cases of fracture dislocation. We analyze epidemiological characteristics, type of treatment received and complications. We carry out a functional

assessment through scales QUICK DASH and MAYO WRIST SCORE and study the range of movement.

Results: In 14 cases was associated significant systemic injury. The most frequent pattern was the transscaphoid perilunate fracture dislocation with 10 cases.

We compared a protocolized treatment with open reduction and internal fixation and repair of capsuloligamental parts with a heterogeneous set of treatments that do not include all these elements. The average follow-up was 35 months.

The average score of scales QUICK DASH for non protocolized processing and protocolized were respectively 82 and 53 and for the MAY WRIST SCORE 54 and 78. We found a tendency to better clinical outcomes in the patients in the protocolized group of treatment.

Conclusion: Treatment schedules currently accepted recommend the open reduction and internal fixation with capsuloligamental repair.

References: Herzberg G. Perilunate and Axial Carpal Dislocations and Fracture Dislocations. J Hand Surg 2008; 33A:1659-68. Grabow RJ, Catalano L. Carpal Dislocations. Hand Clinics. 2006;22:485-500. Herzberg G, Comtet JJ, Linscheid RL, Amadio PC, Cooney WP, Stalder J. Perilunate dislocations and fracture-dislocations: a multicenter study. J Hand Surg. 1993;18:768-79. Murray PM. Dislocations of the wrist: Carpal Instability Complex. Journal of the American Society for Surgery of the Hand. 2003;3:88-99. Rosales RS, Delgado BS, De la Lastra ID. Evaluation of the Spanish Versión of the DASH and Carpal Túnel Síndrome Health-Related Quality-of-Life Instruments: Cross-cultural Adaptation Process and reliability. J Hand Surg[Am].2002; 27: 334-43. Dumontier C, Reckendorf GM, Sautet A, Lenoble E, Saffar P, Allieu Y. Radiocarpal dislocations: classification and proposal for treatment. J Bone Joint Surg. 2001; 83A: 212-18. Sotereanos DG, Mitsionis GJ, Panayotis N, Tomaino M, Herndon JH, Pittsburgh PA. Perilunate dislocation: a critical analysis of the volar-dorsal approach. J Hand Surg. 1997;22A:49-56. Trumble T, Verheyden J. Treatment of isolated perilunate and lunate dislocations with combined dorsal and volar approach and intraosseous cerclage wire. J Hand Surg. 2004;29A:412-17. Knoll VD, Allan C, Trumble TE. Trans-scaphoid perilunate fracture dislocations: results of screw fixation of the scaphoid and lunotriquetral repair with a dorsal approach. J Hand Surg. 2005;30A:1145.e1-1145.e11.

Disclosure: No significant relationships.

PELVIS – ACETABULUM – SPINE

PM018 Effect of a New Pelvic Stabilizer (T-POD®) on Reduction of Pelvic Volume and Haemodynamic Stability in Unstable Pelvic Fractures

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Introduction: Patients sustaining pelvic injuries, often the result of high energy blunt trauma, results in severe morbidity and far too

often, mortality. A new pelvic stabilizer (T-POD[®]) provides secure and effective simultaneous circumferential compression of the pelvis.

Material and Methods: In this study we have managed fifteen patients with a prehospital untreated unstable pelvic fracture with signs of hypovolaemic shock with the T-POD[®]. Before and 2 minutes after applying the T-POD[®], heart rate and blood pressure were measured. An X-ray before and after applying the T-POD[®] was made to measure the effect on reduction in symphyseal diastasis.

Results: Application of the T-POD[®] reduced the symphyseal diastasis with 60% (n=12; p=0.01). The mean arterial pressure (MAP) increased significant from 64.7 to 81.2 mmHg (n=10; p=0.04) and the heart rate declined from 106 beats per minute to 93 (n=10; p=0.04). In ten patients of whom circulatory response before and after the T-POD[®] was recorded, there were seven good responders, one transient and two poor responders.

Conclusion: In the acute setting, the T-POD[®] device has a clear compressive effect on the pelvic volume in unstable pelvic fractures. The T-POD[®] is therefore an easy to use and effective way of (temporarily) stabilizing the pelvic ring in an acute setting.

Disclosure: No significant relationships.

PM019 Pelvic Fracture Related Bleeding in Pediatric Patients

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Introduction: Pediatric pelvic ring fractures are rare, but the associated morbidity is high. The mortality of patients with pelvic ring fracture is lower in children than in adults. The aim of the present study was to evaluate pelvic ring fracture-associated life-threatening hemorrhage in children (0-16 years).

Material and Methods: We identified all pediatric pelvic ring fractures treated in Helsinki University Central Hospital in a 10-year period (1998-2007). All available pre- and in-hospital medical records were reviewed. The collected data consisted of patient characteristics, the mechanism of injury, vital signs, results of laboratory tests, given care, diagnosed other injuries, and the 30-day survival. We identified 71 pediatric patients (40 males) with pelvic fractures (median age 14, range 1-16 years). Traffic accident was the most common mechanism of injury (69%). The average vital signs on admission were: systolic blood pressure 120 mmHg, heart rate 102/min, and Glasgow Coma Scale 15.

Results: Total of 4 patients had life-threatening bleeding and only in 2 patients the source of massive bleeding was pelvis. One patient required emergency surgery and angioembolization for pelvic bleeding. Pelvic ring fractures were surgically treated in 25 patients. 35 patients did not need any operative treatment for their injuries. Two patients died for head injuries, and no patient died for exsanguination.

Conclusion: We conclude that a life-threatening hemorrhage from pelvic ring fracture is rare (5.6%) and does not contribute to the overall mortality. The mortality was low (2.8%) and was due to head injuries.

Disclosure: No significant relationships.

PM020 Fractures of the Pubic Rami Can Be Life-Threatening Injuries – A Case Report

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Introduction: Fractured pubic rami are common in the elderly population, most of which heal without event. We report a case of massive retroperitoneal haemorrhage associated with a right superior pubic ramus fracture, causing haemodynamic instability in a patient receiving antiplatelet therapy.

Material and Methods: A 77 year-old woman was admitted following a mechanical fall to the right side. Medical history included ischaemic heart disease treated with both aspirin and clopidogrel. Admission haemoglobin was 9.8 g/dL; she was pale and hypotensive. She was complaining of lower abdominal pain with a suprapubic mass, and had signs of peritonism but a clinically stable pelvis.

Results: An urgent CT of her abdomen and pelvis was performed, revealing a mixed attenuation retroperitoneal mass consistent with a haematoma. There was also a comminuted fracture of the right superior pubic ramus. No other retroperitoneal or abdominal source for the bleeding was identified. Repeat haemoglobin was 6.1 g/dL and she was transfused 4 units of packed red cells, FFP and platelets. Her haemoglobin stabilised and she went on to make a full recovery after restarting both aspirin and clopidogrel.

Conclusion: This case illustrates the importance of eliciting a detailed medical and drug history, as well as the dangers of anti-platelet drugs in a normally benign fracture.

Disclosure: No significant relationships.

PM021 Traumatic Hip Dislocation. A 13-Year Case Series 1995-2007.

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Introduction: Traumatic hip dislocation (THD) is a true orthopaedic emergency. We present the incidence of total hip replacement (THR) following THD in a 10-year series with at least 1-year follow up.

Material and Methods: Patients admitted to Rigshospitalet from 1.1.1995 to 31.12.2007 with THD, were identified in hospital records as ICD10 = "S73.0". Available admission radiographs were reviewed, fractures were classified according to the AO classification. Patients who subsequently went on to have a THR on the affected side were identified through the Danish Hip Register. The remaining patients were contacted for a phone interview incl. EQ-5D and the pain/function sections of Harris Hip Score (HHS) (max. score 91).

Results: Thirty-one patients (25 male, 6 female) were identified, mean age 39 years (18-75). One had an anterior dislocation. Of the posterior dislocations, 16 were associated with acetabular fracture, 3 with femoral head fracture and 5 with acetabular and femoral head fractures. In 24 cases closed reduction was performed (all within 24hrs); unsuccessfully in 5 cases. Sixteen had traction applied. Surgery was performed after an average of 3 days (1-8): 20 ORIF of acetabular fracture, 1 ORIF of femoral head fracture and 1 primary THR. Early complications were: Sciatic nerve palsy (8 patients, all with acetabular fracture), wound infection (4 patients), pulmonary

embolism (1 patient). Mean follow up was 67 months (17-126). Two patients had died of cancer. Seven patients had a THR, 2 with femoral head fracture, 3 with acetabular fracture, 2 with acetabular and femoral head fractures. Nineteen patients were interviewed: Median HHS 79%. The patients without fracture had a higher HHS, median 93% ($p=0.15$, Mann-Whitney U test); none of these had a THR.

Conclusion: Traumatic hip dislocation resulted in total hip replacement in 7 out of 31 patients. Traumatic hip dislocation without fracture did not lead to total hip replacement within 27-118 months. The morbidity following traumatic hip dislocation is in large part determined by the associated fractures.

References: Bhandari M, Matta J, Ferguson T, Matthys G. Predictors of clinical and radiological outcome in patients with fractures of the acetabulum and concomitant posterior dislocation of the hip. *J Bone Joint Surg Br.* 2006 Dec;88(12):1618-24. Sahin V, Karakaş ES, Aksu S, Atlihan D, Turk CY, Halici M. Traumatic dislocation and fracture-dislocation of the hip: a long-term follow-up study. *J Trauma.* 2003 Mar;54(3):520-9. Alonso JE, Volgas DA, Giordano V, Stannard JP. A review of the treatment of hip dislocations associated with acetabular fractures. *Clin Orthop Relat Res.* 2000 Aug;(377):32-43. Review. Rodríguez-Merchán EC. Coxarthrosis after traumatic hip dislocation in the adult. *Clin Orthop Relat Res.* 2000 Aug;(377):92-8.

Disclosure: No significant relationships.

PM022 Traumatic Anterior Hip Dislocation in an 8 Year Old Child: A Case Report and Review of the Literature

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Introduction: Traumatic dislocation of the hip is a relatively rare occurrence in the paediatric population. The trauma required to produce a dislocation can vary from minimal to severe high-energy forces. Anterior dislocation of the hip in this age group is to be considered a serious injury.

Material and Methods: We report a case of anterior hip dislocation in an 8 years old boy who suffered a hit by a car. The child's hip was reduced under general anaesthesia without delay (1 hour after the injury) and without sequelae. MRI examination after reduction revealed haematoma associated with partial rupture of the obturator externus muscle and adductor minimus muscle, without other associated lesions. After the reduction, the child was submitted to skin traction with adhesive strapping for 15 days. Subsequently, gradual weight bearing was allowed.

Results: After 1 year, functional result of the hip was good without restriction of physical activity of this child. The radiographic and MRI examination showed normal hip joints.

Conclusion: Despite the severe intensity of the trauma, the fact that it was an anterior dislocation without associated injuries (fractures

and open dislocation) and the child had the dislocation reduced promptly, possibly contributed to the good result obtained in the follow-up. A review of the literature shows that, if the diagnosis and an immediately reduction are delayed, the morbidity, such as avascular necrosis or osteoarthritis of the femoral head, may be significant. A poor prognosis is conferred by trauma of considerable intensity, the presence of fractures associated with the dislocation, open dislocation, delayed reduction and advanced skeletal maturity of the patient.

References: Barquet A. Tarumatic anterior dislocation of the hip in childhood. *Injury* 1982 Mar Dreinhofer et al. Isolated traumatic dislocation of the hip - Long-term results in 50 patients. *Journal of Bone and Joint Surgery* Fama G, Pavanini G, Bonaga S. Traumatic luxation of the hip in children. *Chir Organi Mov* 1989 Jul-Dec Hougaard K, Thomsen PB. Traumatic hip dislocation in children, Follow up of 13 cases. *Orthopedics* 1989 Mar Offierski. Traumatic dislocation of the hip in children. *Journal of Bone and Joint Surgery - British Volume* Beaty JH, Kasser JR. Rockwood and Wilkins' *Fractures in Children* - 6th edition. Lippincott Williams and Wilkins

Disclosure: No significant relationships.

PM023 Total Hip Arthroplasty After Acetabulum Fractures

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Introduction: Avascular necrosis of the femoral hip is main reason of pure results of acetabular reconstructions.

Material and Methods: During the last 8 years total hip arthroplasty (THA) has been done in 23 cases of old and nonunion acetabular fractures. Mostly surgery was performed due to the avascular necrosis (AVN) of the femoral head, which happened in time period of 10 months up to 4 years after the primary acetabular reconstruction. Just in 3 cases we faced redisplacement of bone fragments with hip subluxation. In these cases cemented acetabular cups and reinforcement rings were used. Surgery was performed via the Kocher-Langenbeck's approach to hip joint. If the anatomical reconstruction of acetabulum was achieved and bone quality was satisfactory, large heads, metal-metal bearing THA was used. In other cases, traditional cementless cups with additional screw fixation were implanted. 4 patients with old T-type acetabular fractures were operated on in 6 months up to 2 years after injury by using the acetabular reconstruction and THA simultaneously. These operations were performed via two surgical approaches. It allowed us to expose the fracture well, perform stabile osteosynthesis without the devascularization of bone fragments and conclude the surgery with THA.

Results: Satisfactory results and implant stability were assessed in each case of THA at 1-5 year's follow up.

Conclusion: THA provides a possibility to use a new generation of implants in cases of posttraumatic hip arthritis after primary anatomical acetabular reconstruction. When old acetabular fractures with AVN of the femoral head are operated, simultaneous pelvis reconstruction and THA could be done.

Disclosure: No significant relationships.

PM024 Total Hip Arthroplasty After Operative Treatment of Acetabulum Fractures

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Introduction: The aim of the present study was to evaluate the clinical results of total hip arthroplasty in patients with post-traumatic osteoarthritis after internal fixation of a displaced acetabular fracture. Special attention was paid to the frequency of technical difficulties and the risk of postoperative complications.

Material and Methods: The pattern of the acetabular fracture was classified according to the system of Letournel. 15 of the acetabular fractures were sustained in a motor-vehicle accident and two were the result of a fall from height. Secondary arthroplasty was performed without cement through an anterolateral approach in seventeen hips at a mean age of 53.6 years (range, 27-81 years); bone graft was used in 3 patients. The mean age of the patients at the time of injury was 42 years (range, 26-71 years). Time between primary surgery and secondary arthroplasty was 12.1 years (range 1-31 years). Heterotopic bone was classified preoperatively according to Brooker in 4 grades.

Results: Harris hip score showed 55.2 points preoperatively. According to Brooker, preoperatively, 7 patients were graded I, 6 patients grade II, 4 grade III and 1 patient grade IV. Three procedures were associated with operative complications; screws or plates from primary surgery had to be removed in 4 patients. Three patients had a revision; all of them were performed because of aseptic loosening of one or both components (two acetabular and one femoral component).

Conclusion: In summary, the present study demonstrates that total hip arthroplasty after previous operative treatment of an acetabular fracture is often more difficult than a routine total hip arthroplasty because of extensive scar tissue, heterotopic bone, retained internal fixation devices, and deformity of the acetabular bone. Despite these difficulties, the clinical outcome was good in most patients and the rate of complications was moderate.

References: Weber M. et al. Total hip arthroplasty after operative treatment of an acetabular fracture. JBJS (1998); 80-A:1295-1305.

Disclosure: No significant relationships.

PM025 Axis or Harris Ring in Odontoid Fractures, Old Fashioned But Not Obsolete

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Introduction: Clearing the cervical spine in the emergency room remains an enormous challenge. Although the use of computed tomography scan in routine trauma evaluation of the cervical spine is advocated in the literature, the classical three-view X-rays still remain the basis of cervical spine evaluation as recommended in the ATLS guidelines. In 1984, Harris et al. described an oval, ring-shaped, cortical density superimposed upon the superoposterior body

of the axis in the lateral view could be of a great help in identifying low odontoid fractures. The Harris ring!

Material and Methods: A series of 12 CT scan confirmed isolated low-axis fractures from our own level one trauma centre practice archive and 13 CT negative controls on lateral cross-table cervical spine X-rays were presented randomly to 17 training residents and five experienced trauma radiologists with knowledge of the axis ring sign. The effect of the education on the fracture identification rate in the three resident groups was evaluated with the nonparametric Wilcoxon ranking test.

Results: The specificity and sensitivity of the axis ring sign used by experienced radiologists was between 72–91% and 80–96%, respectively, and a DOR of 31.74 (4–63.08) was calculated. They scored a PPV of 86% (77–95%) and a NPV of 84% (74–93%). The Wilcoxon ranking test revealed a significant effect of education in all three resident groups (traumatologists P=0.0008, emergency medicine P=0.0005 and neurosurgery P=0.0087).

Conclusion: In conclusion, we would state that the axis or Harris ring is a forgotten but useful diagnostic and educational tool in identifying low odontoid fractures and that it should be incorporated in all X-ray-based cervical spine clearing protocols.

References: 1. Hoffman JR, Mowes WR, Wolfson AB. Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. N Engl J Med 2000; 343:94–99. 2. Kirshenbaum KJ, Nadimpalli SR, Fantus R, Cavallino RP. Unsuspected upper cervical spine fractures associated with significant head trauma: role of CT. J Emerg Med 1990; 8:183–198. 3. Gale SC, Gracias VH, Reilly PM, Schwab CW. The inefficiency of plain radiography to evaluate the cervical spine after blunt trauma. J Trauma 2005; 59:1121–1125. 4. Hadley MN. Radiographic assessment of the cervical spine in symptomatic trauma patients. Neurosurgery 2002; 50:36–43. 5. Harris JH Jr. Missed cervical spinal cord injuries. J Trauma 2002; 53:392–393. 6. Harris JH Jr, Burke JT, Ray RD, Nichols-Hostetter S, Lester RG. Low (type 3) odontoid fracture: a new radiographic sign. Radiology 1984; 153:353–356. 7. Anderson LD, D'Alonzo RT. Fractures of the odontoid process of the axis. J Bone Joint Surg 1974; 56A:1663–1674. 8. Mortelmans LJM, Geusens EAM, Sabbe MB, Delooy HH. Harris or axis ring: an aid in diagnosing low (type 3) odontoid fractures. Eur J Surg 1999; 165:1138–1141.

Disclosure: No significant relationships.

PM026 Comparison of the Effects of Surgical Approaches on the Local Kyphosis Angle in Vertebral Fractures

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Introduction: Thoracolumbar and lumbar fractures treated with surgical methods aim to decompress the spinal cord and correct the deformity. We aimed to compare the effects of anterior, posterior and anterior-posterior surgery on the local kyphosis angle in thoracolumbar and lumbar vertebral fractures.

Material and Methods: Thoracolumbar and lumbar, burst or compression fractured and surgically treated 62 patients were evaluated retrospectively. Preoperative, postoperative and follow-up local

kyphosis angles were measured on the X-rays and changes in these angles were compared according to the applied surgical treatment methods.

Results: Early application of surgical treatment following trauma decreases the correction loss suffered after surgery. The increase in correction loss continues after removal of the hardware. It is observed that laminectomy applied in the course of posterior surgical interventions has no effect on the correction loss. The length of the implantation, fusion and the addition of a hook to the lamina of the vertebra which is located one segment lower than the transpedicular screw applied vertebra do not affect the loss of correction.

Conclusion: In the surgical treatment of thoracolumbar and lumbar vertebral fractures, different degrees of correction loss are observed after each surgical treatment modality. Considering the corrective effect of combined anterior-posterior surgery on the correction of kyphotic deformity due to trauma and the preoperative local kyphosis angle, follow-up correction achievement is higher when compared with anterior and posterior surgical approaches.

References: 1. Hanley EN, Simpkins A. Operative treatment of spinal injuries: Surgical management. In: Browner BD, Jupiter JB, Levine AM, Trafton PG (Eds.). *Skeletal trauma*. 1st ed. Philadelphia: W. B. Saunders Company; 1992. p. 645-63. 2. Meyer PR. Complications of treatment of fractures and dislocations of the dorsolumbar spine. In: Epps CH (Ed.). *Complications in orthopaedic surgery*. Vol 2. 2nd ed. Philadelphia: J. B. Lippincott Company; 1986. p. 713-94. 3. Norrel HA. Fractures and dislocations of the spine. In: Rothman RH, Simeone FA (Eds.). *The Spine*. Vol 2. Philadelphia: W.B.Saunders Company; 1975. p. 557-66. 4. Vaccaro AR, Kim DH, Brodke DS, Harris M, Chapman JR, Schildhauer T et al. Diagnosis and management of thoracolumbar spine fractures. *J Bone Joint Surg Am*. 2003; 85(12): 2456-70. 5. Katonis PG, Kontakis GM, Loupasis GA, Aligizakis AC, Christoforakis JJ, Velivassakis EG. Treatment of unstable thoracolumbar and lumbar spine injuries using Cotrel-Dubousset instrumentation. *Spine* 1999; 24(22):2352-7.

Disclosure: No significant relationships.

PM027 Comparison of Balloon Kyphoplasty and Vertebroplasty One Year Postoperatively

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Introduction: Comparison of balloon kyphoplasty and vertebroplasty one year postoperatively Igor Movrin, Rok Vengust, Radko Komadina. The literature is inconclusive on the risk of increased adjacent level fracture after vertebroplasty and kyphoplasty, with rates of adjacent level fractures varying widely for both vertebroplasty (8-52%) and kyphoplasty (3-29%). It is still controversial whether new compression fractures should be regarded as the consequence of

stiffness by augmentation with bone cement or if they are simply the result of the natural progression of osteoporosis. It was reported that cement leakage into the disc increases the risk of new fracture of adjacent vertebral bodies.

Material and Methods: The analysis compares at least one year-late-results after two different percutaneous operative methods.

Results: The adjacent level Th-L fracture was found in 6.5% (3/46 patients) in kyphoplasty group and in 7% (2/27 patients) in vertebroplasty group. We did not found any serious complication but established postoperative BMD loss. We did not found any intradiscal cement leakage in cases with adjacent level fractures. Intraoperative correction of kyphosis was better achieved in kyphoplasty group; pain relief was similar in both groups.

Conclusion: Natural process of further bone loss seems to be the most influent factor for future compression fractures in elderly patients.

Disclosure: No significant relationships.

PM028 Bioresorbable KyphOs™ FS(R) Calcium Phosphate Bone Substitute in Balloon Kyphoplasty for the Treatment of Traumatic Vertebral Body Fractures: 1 Year Results

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Introduction: Traumatic vertebral body fractures are an important source of morbidity. Balloon kyphoplasty (BKP) using Polymethylmethacrylate (PMMA) cement has become a standard treatment in fragility fractures, but PMMA lacks the capability of remodelling. In younger patients a more bio-compatible/bio-resorbable alternative would be preferable.

KyphOs™ FS(R), a calcium magnesium hydroxyapatite cement that mimics the anorganic component of bone, has been specifically developed for use during BKP and does match the above mentioned criterium of biological bone substitute. This single-arm multicentric clinical study was initiated to evaluate the safety and effectiveness of this cement during BKP in younger patients with stable traumatic VB fractures with a follow-up of 1 year.

Material and Methods: 50 Patients, aged 50 years or less, with up to 3 traumatic VB fractures of type A1.1, A1.2 or A3.1, according to the Magerl/AO classification were included. The primary endpoint was the change from baseline in the 24 point Roland Morris Disability Questionnaire (RMDQ) score at 7 days. Secondary endpoints included the quality of life as measured by EuroQol-5

Domain questionnaire (EQ-5D), the 10 point self-rated back pain (VAS) and device and/or procedure related adverse events.

Results: 63 fractures were treated. 6% were A1.1, 68% were A1.2 and 25% were A3.1.

Mean RMDQ score at baseline was 19.34 pts (95% CI 18 – 20.68). The change from baseline in RMDQ at 7d was 8.84pts ($p<0.0001$) and respectively 16.42pts ($p<0.0001$) at 3mo, 17.88pts ($p<0.0001$) at 6mo and 17.70pts ($p<0.0001$) at 12mo. Mean total EQ-5D score at baseline was 0.16 pts (95% CI 0.04 – 0.28). The change from baseline in total EQ-5D at 7d was 0.48pts ($p<0.0001$) and respectively 0.70pts ($p<0.0001$) at 3mo, 0.77pts ($p<0.0001$) at 6mo and 0.76pts ($p<0.0001$) at 12mo. Mean VAS score at baseline was 7.31pts (95% CI 6.79 – 7.82). The change from baseline in VAS at 7d was 4.44pts ($p<0.0001$) and respectively 5.64pts ($p<0.0001$) at 3mo, 5.61pts ($p<0.0001$) at 6mo and 6.05pts ($p<0.0001$) at 12mo. There were no device-related serious adverse events during the first 7 days after the surgery.

Conclusion: The minimal clinical important difference on the RMDQ is 2-3pts[1]. In this study we obtained a 3-fold difference of 8.84 points at 7 days. The results on RMDQ were confirmed on all the other secondary endpoints with further improvement up to 12 months. We conclude, that the use of KyphOs FS(R) Bone Substitute during BKP, appears to be a safe and effective method to treat stable traumatic vertebral fractures in younger patients.

References: [1] Patrick E et al. Spine 1995; 20:1899-1909

Disclosure: All authors received scientific research funding and/or honoraria from Medtronic (study sponsor).

PM029 Transmedistinal Approach for Spinal Cord T2–T7 Level – Case Report

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Introduction: The paperwork presents the surgical technique used by the authors in a multidisciplinary approach for the spinal cord pathology at the cervico-thoracic border.

Material and Methods: We present and illustrate 3 cases of vertebral tumor located on C7-T2 vertebrae. The steps were: “Y” cervicotomy, partial longitudinal sternotomy, midline progression between thyroid gland (above) and unnominate left vein (below) with the ligation, of the inferior thyroidian vessels, right pulling of the trachea and esophagus and left pulling of left carotid artery and left jugular vein.

Results: Our surgical approach, different from the usual one, seems to be better, offering a good surgical comfort and visualization. This approach allows a sure vertebral body resection with cement and screw-plate fixation.

Conclusion: We recognise that this approach is worth to be considered by the surgeons dealing with the cervico-thoracic border pathology.

Disclosure: No significant relationships.

EDUCATION – TRAUMA REGISTRIES

PM030 Teaching Standardized Trauma Care – 6 Years of Advanced Trauma Life Support (ATLS) in Germany

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Introduction: Acute trauma care is a dynamic and complex situation with a high workload in a short time period. Decisions must be made before complete information is available. Such stressful situations increase the risk of human failure. The science of teamwork training has been studied in commercial aviation for the past 20 years. Cockpit Resource Management (CRM) and decision-making methods like FORDEC were developed after it was identified that 70% of aircraft-related fatalities were a result of human error and poor teamwork. The aviation industry's success in reducing critical errors has spared many lives. Mistakes are inherent in human nature. Mistakes can be minimized by following a standardized approach. Advanced Trauma Life Support (ATLS) is one such approach in trauma care. With over 1 million certified physicians worldwide, the ATLS concept is one of the most successful international education programs. The concept is simple, priority-orientated assessment (ABCDE-Scheme) of the trauma patient, based on vital signs, with immediate treatment of life threatening injuries.

Material and Methods: With over 100 ATLS provider courses and 10 instructor courses accomplished in less than 6 years; never before has such a course been implemented in such a short time as in Germany. Meanwhile, nearly 1600 physicians are trained and certified.

The post course evaluations of the first 100 ATLS Courses in Germany were analyzed. Each provider student in the course had to score the different parts of the course and the overall impression. The grading range was 1 to 4 (1=very good, 4=very poor).

Results: The overall evaluation of all 100 courses shows an impressive 1.37 [1.13-1.74, n=100]. The specific parts of the courses are graded as follows: Presentations 1.62 [1.0-2.37, n=100], Practical Skills Stations 1.44 [1.0 -2.4, n=100], Surgical Skills Stations 1.35 [1.06-1.64, n=100).

Conclusion: The educational concept is multidisciplinary, with physicians from various fields working together in the trauma room, speaking the same language: ATLS!

Disclosure: No significant relationships.

PM031 Interprofessional TEAM Training Program Improves ATLS Confirmed Management in a Level I Trauma Centre

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Introduction: In the last three decades Advanced Trauma Life Support (ATLS) has become the most successful training course for early clinical management of multiple injured patients all over the world. However, in order to implement ATLS principles into clinical routine especially in an emergency department (ED), it seems necessary to introduce an interdisciplinary interprofessional training program. The question arise, whether an extensive training for every member of the staff is necessary in a level I trauma centre.

Material and Methods: Trauma evaluation and management (TEAM) was originally developed for the training of undergraduate students in ATLS algorithm. The lecture of TEAM was the theoretical basis for 2 hours hands on training with stuff of the ED including trauma surgeons, anaesthesiologists, radiologists, nurses and paramedics. The simulation training was performed in the original environment of the ED with 3 Manikins (Resusci Anne, Laerdal). A questionnaire assessed the basic knowledge and the stuff's expectation about the training.

Results: Within 10 months 44 physicians and 32 nurses participated in the TEAM training. 85 % of the participants affirmed an improvement of their knowledge concerning ATLS principles and rated the course program to be good or excellent. Therefore TEAM training is now introduced in routine education of stuff in the ED.

Conclusion: TEAM is an optimal basis for interdisciplinary interprofessional training program in every ED managing multiple injured patients. It is highly appreciated by all members of the staff and is expected to reduce communication deficits and improve performance.

Disclosure: No significant relationships.

PM032 Analysis of Triage Errors During the Implementation of a Tiered Trauma Response Protocol

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Introduction: It has been stated that among 5 to 10% of stable trauma patients without any apparent lesion can be severely injured. An over-triage rate of 30% to 50% is recommended to capture 90% or more of severely injured patients. Tiered response algorithms have proven efficacy and cost-effectiveness in the management of trauma patients. The aim of our study was to analyze the causes and characteristics of the triage failures that occurred

during the implementation of a tiered trauma response protocol in a University Hospital.

Material and Methods: Since January 2006 to March 2009, 876 trauma patients were attended in our emergency department. Of those, only 247 were evaluated in this study: 207 were assessed retrospectively (period 2006-2008) and 40 consecutive patients were included prospectively (2009). Four types of triage failure were defined: Infra-triage, infra-activation, inadequate attendance and misdiagnosis.

Results: Patients were mainly males (79%), mean age 42 ± 20 years. Mean Injury Severity Score was 9 ± 9 . Nineteen percent of patients had ISS ≥ 16 . There were 11% penetrating injuries and 55% of patients sustained some degree of brain injury. One hundred and thirty five patients (54%) required hospitalization with a mean stay of 6 ± 10 days. Forty-four patients (18%) went to surgery and 42 (17%) were admitted to Intensive Care Unit. Mortality was 4% (10 patients). Eighty and five triage failures were detected (44 infra-triages, 16 infra-activations, 16 inadequate attendances and 9 misdiagnosis). There were no significant differences among patients with or without triage errors regarding patient sex ($P=0.6$), study periods ($P=0.08$), time of admission ($P=0.63$), or hospital stay (6.1 ± 7 vs. 6.4 ± 11 days; $P=0.8$). In our series, triage failures tend to occur in older patients (47 vs. 40 years; $P=0.02$) and they were concentrated in aggressions and accidental falls ($P=0.002$). Triage errors were not associated mortality ($P=0.52$). The mechanism of injury more frequently associated with mortality was fall from height ($P=0.02$). Most patients with infra-triage had inclusion criteria related to their medical history (advised criteria), and the situation with higher mortality rates was the combination of physiologic and those advised criteria ($P=0.008$).

Conclusion: The triage errors detected during the implementation of a strict tiered trauma response protocol had no repercussion in mortality. To avoid those triage failures, special attention must be paid to older patients, aggressions and accidental falls.

Disclosure: No significant relationships.

PM033 Utility of the Tertiary Survey in the Incidence of Missed Injuries in Trauma Patients

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Introduction: The missed injuries and the clinically significant missed injuries have a high incidence in trauma patients. The application of tertiary survey can reduce the incidence of these injuries.

Material and Methods: Prospective study that includes all trauma patients over 16, admitted in critical area and that excludes patients who die before this admission. A missed injury is an injury which is detected after the first 24 h of the traumatism. Clinically significant missed injuries are serious missed injuries which can cause complications, to change a treatment or even the death of the patient. Since March 2009, we apply a protocol where tertiary survey is done in all trauma patients after the primary and secondary surveys but in the first 24 h of the traumatism.

Results: Until October 2009, 84 trauma patients have been registered with the application of the protocol of the tertiary survey, with an ISS of 25.8. 4 patients have been excluded because they died before the

admission. The tertiary survey has been done in the 94.2% of the patients. This group of patients has been compared with control group composed to 121 trauma patients, with an ISS of 19.55, prospectively registered between January 2006 and February 2007 when tertiary survey was not applied. The ethic committee of the hospital did not accept a randomized study because of the results in this proof of concept, they accepted the study with a minimum of 69 patients (based on the results of a previous proof of concept). The incidence of missed injuries without the application of the tertiary survey was 45% and this incidence has been reduced to 4% with the application of the tertiary survey (it means a reduction of the 91.1% in the incidence of missed injuries). The incidence of clinically significant missed injuries without the application of the tertiary survey was 23% and it has been reduced to 0% with the application of the tertiary survey (it means a reduction of the 100% in the incidence of missed injuries).

Conclusion: The tertiary survey is an essential task in the management of the trauma patients to reduce the incidence of missed injuries and clinically significant missed injuries.

References: § Janjua KJ, Sugrue M. JTrauma. 1998; 44 (6): 1000-1007 § Gordon B, Donna I. JTrauma. 2000; 49: 600-605 § Biffi WL, Harrington DT. JTrauma. 2003; 54: 38-44 § Brooks A, Holroyd B. Int. J. Care Injured. 2004; 35: 407-410 § Houshian S, Larsen M. JTrauma. 2002; 52: 715-719 § Montmany S, Navarro S, Rebasa P, CirEsp. 2008; 84(1):32-6 § Navarro S. CirEsp. 2005; 78(5): 281-282 § Soundappan SV, Holland AJ. JTrauma. 2004; 57(1): 114-118 § Robertson R, Mattox R. AmJSurg. 1996; 172: 564-568 § Sawyer M. AACN Clin Iss. 1995; Vol.6, No2: 187-195 § Howard J, Sundararajan R. JTrauma-Nurs. 2006; Vol 13: No 3 § Enderson BL, Reath BD. JTrauma 1990; 30: 666-670 § Enderson BL, Maull KI. SurgCNAm. 1991. No 2, April. Vol 71. § Stephan PJ, McCarley C, O'Keefe GE. JTrauma. 2002; 53: 895-900 § Hollingsworth-Fridlund P, Stout P. . Oct-Dec 2001; vol 8, no 4

Disclosure: No significant relationships.

PM034 Consent in Trauma: Does Written Information Improve Patient Understanding?

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Introduction: Informed consent is vital to good surgical practice. Trauma patients represent a challenge in terms of obtaining informed consent as they are often in significant pain and maybe under the influence of strong medication at the time of the consent process. We designed a prospective, randomised un-blinded control study to test the hypothesis that there would be no difference in the ability of trauma patients to recall details of the consent process whether the patients were given verbal compared with verbal and written information.

Material and Methods: A consecutive cohort of trauma patients presenting to a major teaching hospital were recruited and randomised into two groups. Group A received structured verbal information only. Group B received structured verbal information and written information about the proposed procedure. All patients

were interviewed within the first post operative week (mean 3.2 days) and scored on their ability to recall key facts given in the original consent interview. Results were analysed using the Mann-Whitney U test.

Results: 119 patients have been recruited. Information recall was significantly improved in the group receiving written information (mean questionnaire score 64% vs 41% for verbal information alone, p=0.0014). Patient satisfaction with the consent process was also significantly improved in the group receiving written and verbal information, with 97.9% of patients reporting they understood the risks of surgery when they signed the consent form, compared to 83.2% who received verbal information alone (p=0.01).

Conclusion: Written information improves patient recall of the consent process. It is a simple, cost-effective intervention with high patient acceptability.

References:

1. General Medical Council. Consent: Patients and doctors making decisions together. 2008.
2. Bhangu A, Hood E, Mangaleshkar. Is informed consent effective in trauma patients? Journal of Medical Ethics. 2008; 34: 780-782
3. Sava M, Ciesla D, Williams M, Street J, White P, Wang D. Is Informed Consent in Trauma a Lost Cause? A Prospective Evaluation of Acutely Injured Patients' Ability to Give Consent. Journal of the American College of Surgeons. 2007; 205: 405-408
4. Lavelle-Jones C, Byrne DJ, Rice P, Cuscheiri A. Factors affecting the quality of informed consent. BMJ. 1993; 306: 885-890
5. Langdon IJ, Hardin R, Learmonth ID. Informed consent for total hip arthroplasty: does a written information sheet improve recall by patients? Annals of the Royal College of Surgeons of England. 2002; 84: 404-408

Disclosure: No significant relationships.

PM035 Implementation of the Osteoporosis Guideline in Fracture and Osteoporosis Outpatient Clinics in The Netherlands

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Introduction: The number of osteoporotic fractures is expected to increase, due to the world's ageing population. Our national guideline on Osteoporosis recommends that all female patients ≥ 50 years with a minimal trauma fracture should be investigated by Dual Energy X-ray Absorptiometry (DXA) scan and treated in the presence of osteoporosis. Until now, only a few fracture and osteoporosis (F&O) outpatient clinics have presented their results. Therefore, the aim of the present study was to determine the prevalence of clinical risk factors and bone mineral density (BMD) in a cohort of fracture patients treated at the F&O outpatient clinics.

Material and Methods: This prospective study was conducted on five F&O outpatient clinics in the Netherlands. We included all patients ≥ 50 years who presented with a recent clinical fracture at the F&O outpatient clinic. Exclusion criteria were dementia and pathological fractures. To measure BMD, patients underwent a DXA scan. Evaluation of demographic data and other clinical fracture risk factors were collected during the visit at the outpatient clinic by a specialised fracture nurse. BMD was categorised according to World Health Organization (WHO) definitions. Fractures were categorised by ICD 9 encoding. ANOVA and chi-square tests were used to process the data.

Results: In total, 7199 patients were included, 76% women. Mean age was 66.7 years, women vs. men 67.4 vs. 64.4 ($P < 0.001$). The majority of patients sustained a radius/ulna fracture (26%). Moreover, many patients had sustained humerus fractures (12%), hand fractures (12%) and foot fractures (12%). Fracture locations were not similar between sexes, men showed more hand (16%), radius/ulna (15%) and foot (11%) fractures compared to women: radius/ulna: 29%, humerus fracture: 13% and foot fractures 12%. In total, 50% of all fractures could be classified as major osteoporotic (spine, forearm, hip and shoulder) according to the Fracture Risk Assessment (FRAX) tool. 21% of all patients had at least one other previous fracture before the fracture they presented with this time. Osteoporosis (T-score ≤ -2.5) was found in 35% of all women and 23% of all men. Overall, 47% of the patients had osteopenia and 32% had osteoporosis. The highest incidence of osteoporosis was found in patients with hip (45%) and pelvis (44%) fractures. However, the majority of fractures were seen in patients with osteopenia.

Conclusion: In elderly patients with a recent clinical fracture, this multidisciplinary approach diagnosed in 35% of all women and 23% of all men a BMD in the osteoporotic range. Fifty percent of all fractures seen at the outpatient clinics are regarded as major osteoporotic. These results indicate the importance of F&O outpatient clinics. Further studies are needed to clarify whether these clinics might have an effect on subsequent fracture risk reduction.

Disclosure: No significant relationships.

PM036 Surgical Education on a Virtual Reality Knee Arthroscopy Simulator: Non Gamer vs. Gamer

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Introduction: Knee- Arthroscopy is a complex surgical ability. It is a combination of factors like anatomical knowledge, hand-eye coordination, three-dimensional mental activity and operating experience. Surgeons as well as students were not able to train knee arthroscopy before. Parts of these abilities were trained by playing

video games. Former studies indicated a correlation between a better performance in virtual reality (VR) laparoscopy simulation and video game experience. The aim of this study is to show that experienced video gamer perform better in a virtual arthroscopy simulation.

Material and Methods: 164 medical students did an arthroscopy of a longitudinal meniscus tear on a VR knee arthroscopy simulator (the insight Arthro VR ® GMV, Madrid, Spain). The students completed a questionnaire asking for their game experience: none ($n = 123$), monthly ($n = 20$) weekly ($n = 17$) daily ($n = 6$) before they did the arthroscopy. The simulator assessed 4 different parameters: time, distance moved and roughness both for probe and camera and a global score (combination of all metrics).

Results: Students with game experience ($n = 43$) performed significantly ($p < 0.05$) better than not experienced students ($n = 123$). There is a tendency that the performances get better with more game experience.

Conclusion: Gamer performed better in a VR knee arthroscopy than not gamer. These result correlates to the laparoscopic simulator training. There is a tendency of achieving a better performance in VR arthroscopy simulation due to a higher frequency of playing games. Extensive training on the simulator improves the abilities of non-gamers with respect to their arthroscopy skills. We will evaluate these dates in the future.

References: Pedowitz A. et al. (2002). "Evaluation of a virtual reality simulator for arthroscopy skills development." *Arthroscopy* 18(6):E29. Grantcharov T.P. et al. (2007). "The impact of objective assessment and constructive feedback on improvement of labrascopic performance in the operating room." *Surg Endosc* 21(12):2240-3.

Disclosure: No significant relationships.

PM037 Can Trauma Registries Help Demonstrate Different Management Strategies of Polytrauma Patients? An Analysis Focusing on Prehospital Management Using Data from STAG (Scottish Trauma Audit Group) and the Trauma Registry of the DGU (Deutsche Gesellschaft fuer Unfallchirurgie)

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Introduction: Trauma is noted to be one of the leading causes of death and adverse socioeconomic impact in many societies all over the world. The question of whether to use Advanced Life Support (ALS) or Basic Life Support (BLS) in the pre-hospital setting has

been the source of much debate and a definite answer is not available as yet. This project aims to see if comparisons in polytrauma management between Scotland and Germany can be made through analysis of data from the Scottish Trauma Audit Group (STAG) and the German Trauma Registry (GTR).

Material and Methods: Data analysis was carried out on all retrospectively identified trauma patients from the STAG and the GTR from 2000-2002. Data on epidemiologic parameters, pre-hospital interventions, cornerstones of timeline and patient outcome were collected and combined. Data was then subjected to statistical analysis using student's t-test and chi-squared tests with level of significance set at $p < 0.05$.

Results: 227 patients from the STAG trauma registry and 6878 patients from the GTR were used in our study. Significant differences in Injury Severity Scores (ISS) between both groups were noted with average scores of 24.9 and 29.8 in Scottish and German patients respectively. There was a significantly higher rate of pre-hospital interventions in the German group. Pre-hospital times in the Scottish group (247 +/- 343 min) were significantly longer than that in the German group (73 +/- 41 min). Interestingly, percentage mortality during treatment was noted at 23.8% in the Scottish group and 22.2% in the German group and was not significantly different between both study populations.

Conclusion: Despite the significant differences demonstrated, data from our study does not serve to indicate preference of the Scottish paramedic pre-hospital trauma care system over the physician driven German one or vice versa and does not give indication as to whether pre-hospital BLS or ALS is more advantageous to trauma patients. Further research is required in the form of prospective, randomized, controlled trials.

Disclosure: No significant relationships.

PM038 A Year in the Department of Emergency Medicine University Hospital Center Zagreb: A View on Traumatized Patients

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Introduction: Our objective was to determine a number of injured patients attending Department of emergency medicine University Hospital Center Zagreb, and its ratio to total number of patients referred to surgery of our department, in one year depending on week day, month, season, and some environmental factors as weather conditions and moon changes.

Material and Methods: A retrospective study of patients attending Department of emergency medicine University Hospital Center Zagreb in one year period. For comparison we analyzed one year more. We also used public data of the State's meteorology department. We divided patients according to the age group (we also included children) and severity of trauma.

Results: We used multivariate analysis to analyze our data and found significant correlations of number of visits according to week day, month, season, weather conditions, and in some cases lunar phases.

Conclusion: In our effort to predict the unpredictable, we found some correlations which can improve planning of work in Emergency department. This study may be an introduction to a larger epidemiological study, which could decrease the chaos in some cases still immanent in this field of medicine.

Disclosure: No significant relationships.

PM039 Trauma Patterns in the United Arab Emirates: Data from Hospital-Based Trauma Registry

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Introduction: To study the pattern of injuries in the United Arab Emirates.

Material and Methods: Data held in the Trauma Registry of Al-Ain Hospital were collected prospectively over 3 years (2003-2006) at the main trauma hospital.

Results: 2573 patients were studied (86.6% males) having a mean age of 31.4 years. 50% of patients were from the Indian subcontinent and 18% were UAE nationals. 99% of patients presented immediately following injury. Ambulances brought only 34% of the patients. 40% of trauma took place in the street or highway, 29% in work places and 20% at home. The mechanisms of injury were road traffic collision in 41% and falls in 34%. 45% of injuries were to extremities, 27% to head, face and neck, and 12% to chest. The mean ISS was 5.6. The mean (range) hospital stay was 9.2 (1-150) days; 202 (8%) patients needed ICU admission of whom 28 (13.9%) died. The Mean ICU stay was 5.8 days (range 1-35). Overall mortality was 56 (2.2%).

Conclusion: Road traffic collisions and falls are the main cause of trauma admissions in Al Ain city. Extremities, head, neck, face and chest are the main body regions sustaining injuries.

Disclosure: No significant relationships.

PM040 A Comparison of Accuracy of Different Trauma and Injury Severity Score (TRISS)-like Models in Different Trauma Populations

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Introduction: Because of a growing demand for an easy scoring, reliable and accurate model to evaluate quality of trauma care, this study compares different Trauma and Injury Severity Score (TRISS)-like models with regard to performance and power in different trauma populations.

Material and Methods: A total number of 10777 trauma patients admitted to our level 1 trauma centre between 1997-2006 were included in the analysis. The probability of survival for each patient was calculated if required data were present using the respective formulas of the prediction models of the Major Trauma Outcome Study (MTOS), Trauma Audit & Research Network (TARN) and Base Excess Injury Severity Scale (BISS). Subsequently new coefficients were calculated by logistic regression based on this dataset. Finally, the existing BISS model was extended with the Glasgow Coma Scale and also tested. The discriminative power of all original and updated models was calculated for several subsets of patients using the area under the ROC-curve (AUC), a parameter for prediction accuracy ranging from 0.5 until 1.0.

Results: Far most AUCs had a value of 0.8 or more. For the total population the TARN update 2007 model with new coefficients had the highest AUC (0.924). For the subset of patients in which all parameters for the various models were available the BISS model including GCS had the highest AUC (0.909). All models had a high discriminative power (AUC range 0.878 – 0.990) if patients were younger than 55 years. In older patients, patients with severe head injury or intubated patients the discriminative power of the prediction models dropped.

Conclusion: Relative simple models, like MTOS, TARN and BISS predict mortality pretty reliably. Each model tested in our study had specific advantages and disadvantages. Discrimination power strongly depended on the case mix. The accuracy to predict the chance of survival decreases in severely injured and older patients. Head injury and comorbidity are likely to attribute to this phenomenon. Therefore adjustment for these factors in future models might be necessary.

Disclosure: No significant relationships.

PM041 Patterns of Injury Associated with Motor Vehicle Rollover Ejection

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Introduction: Despite having legislation, laws and decrees requiring safety belt usage, most developed and developing countries experience many motor vehicle crashes where drivers and occupants travel unrestrained. This underutilization of safety belts increases the likelihood of injury, especially when patients are involved in rollover ejection crashes. This study was intended to determine if predictable patterns of injury follow motor vehicle rollover crashes where occupants are ejected from the vehicle.

Material and Methods: This was a retrospective review using the trauma registry for all patients admitted over a 2 year period (November 2007-November 2009). The data abstracted included demographics, crash characteristics, injury pattern data, operative procedures, mortality, and length of stay.

Results: During the study period, 127 patients were admitted following ejection in rollover crashes. There were 118 men(93%) and 9 women(7%). The median age was 26 years. The location within the vehicle could not be determined in seven patients. Of the remainder, 65% were drivers and 35% were passengers. Two thirds of the crashes occurred at night. Injuries were severe (mean Injury

Severity Score(ISS) = 21) and multisystem injuries occurred in 77%. Patients with multi-system injuries shared the following characteristics: 65% had head injuries, 3% had neck injuries, 39% had spinal injuries, 20% had facial fractures, 66% had chest injuries, 33% had abdominal injuries, 60% had extremity injuries and 22% had external injuries. Operative procedures were required in 38% with orthopaedic(17%), abdominal(8%) and neurosurgical(8%) procedures being the most common. Mean hospital length of stay(LOS) was 20 days. The mean ISS = 23 and in-hospital adjusted mortality rate was 25%. Patients with single system injuries had injuries involving the head(67%), spine(10%), abdomen(10%), extremities(3%) and external(10%). Operative procedures were required in only 2/29 patients. Single system injured patients experienced a mean LOS of 4.7 days. The mean ISS = 18 and in-hospital adjusted mortality was 21%. Patterns of injury were similar between drivers and passengers, although passengers tended to be less severely injured(ISS 19 vs 22) and had a lower incidence of head injury(54% vs 70%).

Conclusion: Motor vehicle rollover ejection crashes cause injuries with high injury severity and result in multi-system injuries in most patients. Compared to those with single system injury, patients injured in crashes with multiple system involvement had increased hospital LOS and utilization of resources. Head injuries predominate, and appear to determine mortality, which was similar in both groups. Enhanced enforcement of current seatbelt laws, and the utilization of safety belts by all vehicle occupants may reduce the impact of such violent crashes.

Disclosure: No significant relationships.

PM042 Importance of Sledding Accidents in Wintersport-Accidents

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Introduction: In wintersport-accidents skiing and snowboarding is mostly of importance, however sledding as sport is becoming more popular these last years and thus sledding accidents are increasing. What kind of injuries are encountered mostly in sledding accidents?

Material and Methods: All wintersportaccidents are registered in our emergency departement since 1996/97. Analysis of the accidents is performed after each season

Results: Since 1996/97 4274 wintersport-accidents have been registered. Most of them were due to skiing and snowboarding accidents. However 238 (5.6%) sledding accidents have been treated as well. The season the most busy was 2003/4 with 7%. Lesions at the lower extremity were the most frequent with 44%, followed by injuries at the upper extremity and head. Of all fractures lower leg and ankle fractures were treated more often than forearm- and collarbone fractures. 73% of all pateints were treated as outpatients, 27% as in-patients.

Conclusion: Around 5% of all wintersportinjuries are due to sledding accidents. Injuries at the lower extremity (breaking) are most frequent. Our feeling over the years, that sledding accidents are increasing can not be confirmed with these datas. It is interesting to note, that sledding injuries have to be treated more often as in-patients than the rest of wintersport-patients.

Disclosure: No significant relationships.

PM043 A Comparative Study of Survival of Patients Initially Presenting With a Hip Fracture With and Without Sub-sequent Fracture (Including a Subsequent Analysis According to the Second Fracture: Second Hip, Major Long Bone of Extremity, and Vertebral Body Fracture)

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Introduction: Survivorship of second hip fracture patients is worse than initial hip fracture patients. However, previous studies included in-hospital mortality. The actual survivorship of initial hip fracture patients with subsequent second hip or major long bone of extremity or vertebral body fracture by exclusion of in-hospital mortality patients have not been studied. We aim to compare the actual survival of initial hip fracture patients with and without second hip or subsequent major fracture. In addition, risk factors, mortality causes, and hazards ratio of each fracture groups were studied.

Material and Methods: In 2000-2008, after exclusion of in-hospital mortality patients, 1038 initial hip fracture patients were reviewed and divided into four groups. Group I, II, III, and IV were initial hip fracture patients with second hip, subsequent major long bone of extremity, vertebral body fracture, and without any subsequent fractures, respectively. We set group I, II, and III as study groups comparing the data with group IV (control group). Age, gender, mobility-status, co-morbidity, causes of death, and survival years after hospitalization of last fracture treatment of each group were recorded. Actual survival rate and risk factors difference between initial hip fracture with and without subsequent fracture were analyzed by Chi-square test. Hazards ratio differences among the groups were analyzed by Cox regression models.

Results: There were 34 (3.3%), 71 (6.8%), 160 (15.4%), and 773 (74.5%) subjects in group I, II, III, and IV respectively. At one-year and one-to-five year mortality of group I were 8.8% and 5.9%, group II were 5.6% and 1.4%, group III were 1.3% and 1.9%, and group IV were 4.7% and 1.4% respectively. Statistical analysis by using Chi square test of one-year mortality and one-to-five year mortality rate showed no significant difference among four groups ($p > 0.05$). But from Cox regression analysis, second hip fracture produced significant hazards ratio as 7.98 ($p = 0.02$).

Conclusion: The actual survivorship of initial hip fracture patients with second hip or other subsequent fracture were not different from patients who have only one hip fracture. However, special care should be focused in patients with second hip fracture which produced significantly highest hazards ratio for mortality.

References: 1. Berry SD, Samelson EJ, Hannan MT. Second Hip Fracture in Older Men and Women. The Framingham Study. Arch Intern Med. 2007;167(18):1971-1976
2. Cooper C, Campion G, Melton, III LJ. Hip Fractures in the Elderly: A World-Wide Projection. Osteoporosis Int (1992) 2:285-289

3. Anghong C, Suntharapa T, Harnroongroj T. Major risk factors for the second contralateral hip fracture in the elderly. Acta Orthop Traumatol Turc 2009;43(3):193-198

Disclosure: No significant relationships.

PM044 Implementation of Guidelines by a Fracture Nurse in Patients Presenting With Non-Vertebral Fractures: Effect on Subsequent Fracture Incidence and Survival

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Introduction: A history of fracture increases the risk of subsequent fractures and some fractures are associated with increased mortality. We evaluated the efficacy of implementation of guidelines for osteoporosis by a fracture nurse on incidence of subsequent fractures and mortality within 2 years in patients presenting with a fracture.

Material and Methods: Two cohorts were compared: before ($n = 1921$)(1999-2001) and after intervention ($n = 1413$)(2004-2006). All patients were > 50 years. Pathological and vertebral fractures were excluded. All fractures were confirmed by radiography. Mortality was searched in the national obituary database. The intervention consisted of evaluation of bone and fall related fracture risks by a fracture nurse and accordingly treatment advice. Multivariate Cox regression analysis was used to calculate hazard ratio's (HR) for subsequent fracture incidence and mortality corrected for age, sex and baseline fracture location (major fractures: hip, pelvis, proximal tibia or humerus, multiple ribs and distal femur and minor fractures: all other fractures).

Results: Groups differed at baseline for fracture location (before vs. after intervention: major 44.9% vs. 40.6% and minor 55.1% vs. 59.4%; $p < 0.05$). The absolute risk of a subsequent fracture decreased from 9.9% to 7.3% ($p = 0.008$). Multivariate analysis showed a risk reduction of 30% for a subsequent fracture (HR 0.70; 95%CI: 0.55 - 0.89). The mortality decreased from 17.9% to 11.4% ($p < 0.001$). Cox regression analysis indicated a risk reduction of 37% in mortality (HR 0.63; 95%CI: 0.52 - 0.76). After major fractures mortality decreased by 44% (HR 0.56; 95%CI: 0.45-0.69) (32.1% vs. 19.9%; $p < 0.001$). Mortality after minor fractures was lower and remained unchanged after intervention (6.2% vs. 5.7%).

Conclusion: Fracture nurse risk assessment and intervention are associated with a decrease in subsequent fracture incidence and mortality. Due to the multifactorial nature of the assessment and intervention, it is unclear which part of this intervention is associated with the decrease in new fractures and mortality. Further research to clarify this is needed.

Disclosure: No significant relationships.

HAND – LOWER EXTREMITY**PM045 Osteosynthesis of Distal Radius Fractures With a Micronail**R. Geerts¹, R. van Vugt², A. Werre³¹Orthopaedics, VieCuri Hospital Venlo, Eindhoven, The Netherlands,²Surgery, Radboud University Nijmegen Medical Center, Nijmegen, The Netherlands,³Traumatology, Canisius Wilhelmina Hospital, Nijmegen, The Netherlands

Introduction: Distal radius fractures are common bone fractures in the elderly. The Micronail (Wright Medical Technology) is a minimal invasive, intramedullary, titanium, fixed-angle, fixation method which combines the advantages of the existing fixation methods. This method is particular applicable in dislocated 2-part extra-articular and in minimal displaced 2-part intra-articular fractures.

Material and Methods: A retrospective analysis of 20 distal radius fractures in 18 patients (17 women, median age 78 years, between January 2006 and December 2007) was conducted. All fractures were classified according to the AO-classification. We analysed x-rays, the clinical outcome (more than 1 year) and we described the surgical technique.

Results: According to the AO-classification 12 patients sustained a A2-fracture, 2 patients an A3-fracture, 1 patient a B1-fracture and 1 patient a B3-fracture. 4 Patients sustained an antebrachii fracture. Average ASA-score was 2.4. Average surgical time was 46 minutes. All fractures consolidated without noteworthy loss of height. 1 Patient developed carpal tunnel syndrome and one Micronail dislocated secondarily. All patients experienced good post-operative function of the wrist and had nearly unrestricted range of motion 6 weeks after surgery. No infections or complications related to the osteosynthetic material appeared.

Conclusion: Although still in a learning curve, this minimal-invasive technique seems appropriate in selected distal radius fractures and seems to combine the advantages of the existing fixation methods.

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Disclosure: No significant relationships.

PM046 Volar Plating of Distal Radius Fractures With Acute Median Nerve Dysfunction

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Introduction: The incidence of acute median nerve dysfunction following distal radius fracture is estimated at 4%. Controversy exists regarding the correct treatment of these patients. Urgent carpal tunnel release and direct volar plating is our concept to prevent persistent median nerve dysfunction or neuropathic pain syndrome.

Material and Methods: Over a 5-year period distal radius fractures with clinical signs of median nerve dysfunction were surgically treated according our protocol consisting urgent release of the carpal tunnel and at the same time volar plating with 2.4 mm or 3.5 mm

locking plate (Synthes) through the existing exposure. All patients after volar plating are prospectively controlled after 42, 90, 180 and 360 days in our follow up study.

Results: From 2003 to 2007 we treated 1215 distal radius fractures: non operative treatment (n = 550), volar (526) and dorsal plating (121), external fixation (11) K-wire (3) Pi-Plate (4). 25 patients (22w, 3 m) mean age 67.8 (20.7-87.7) presented with acute median nerve dysfunction. Fractures were classified according the AO-classification AO 23 A2: 1, A3: 11, C1:7, C2: 6. Mean operation time: 80 min. (40-115). Volar 2.4 mm (8x) and 3.5 mm (17x) locking plates were used. Follow up of 20 patients showed complete normalization of median nerve function in 18 patients. In 2 Patients median nerve sensibility did not restore completely. CRPS II occurred in 1 of these patients. After 180 days mean PRWE was 15.3 (0.5 – 64), mean grip strength was 90.5% (47 – 200) of the contralateral side.

Conclusion: In case of median nerve injury secondary to acute distal radius fracture urgent carpal tunnel release and simultaneous volar plating is an efficient concept in preventing persistent nerve dysfunction or even neuropathic pain syndrome. Nerve decompression and also definitive fracture stabilization can be done in one single operation reducing the risk of complications and prolonged hospital stay.

References: D. Ring et al.: Predictors of Acute Carpal Tunnel Syndrome Associated With Fracture of the distal Radius. J Hand Surg 2008;33A:1309-1313

Disclosure: No significant relationships.

PM047 Non-Surgical Treatment of the Distal Radial Fracture. Is There an Advantage in Immobilization in 20 Degrees Dorsiflexion Compared to Immobilization in a Neutral Position?L. Hennen¹, D. Rijpsma², H. M. J. Janzing³, L. Horta¹¹Emergency Department, Viecuri medical centre, Venlo, The Netherlands,²Emergency Department, Viecuri Medical Centre, Venlo, The Netherlands,³Surgery, VieCuri Medical Centre, Venlo, The Netherlands

Introduction: According to the literature immobilization of Colles-type distal radial fractures in 20 degrees dorsiflexion has a possible advantage over immobilization in a neutral position.

Material and Methods: Patients with a distal radial fracture of AO-type A2.2, A3, C1 or C2 where included. They were randomized in 2 groups; immobilization in a neutral position or immobilization in 20 degrees dorsiflexion. End points were radiological (dorsal dislocation, radial inclination), functional, the necessity for surgical intervention, VAS-scores and the occurrence of CRPS type-I. Follow-up moments were at 1, 3, 6 and 12 weeks. Functional recovery was reevaluated at 36 and 52 weeks. At an inclusion of 10 patients in both groups an interim-analysis was scheduled.

Results: A total of 22 patients where included at the time of the interim-analysis. There was a significant higher drop-out rate in the 20 degrees dorsiflexion group. 7/11 patients dropped out in the dorsiflexion group and 2/11 in the neutral group. The reason of this drop-out was the need for surgical intervention due to an unacceptable

reduction or redislocation after one week of treatment. Due to the lack of sufficient patient data a statistical analysis was not carried out. It was obvious that the dorsal dislocation after reduction was worse in the dorsiflexion group. There was no obvious difference in radial inclination or functional outcome between the two groups.

Conclusion: Mainly the dorsal inclination was worse in the 20 degrees dorsiflexion group. A possible explanation for these results is the technique used when modeling the plaster cast. In our hands immobilization in dorsiflexion yielded poorer results than immobilization in a neutral position. Due to the poor results the study was terminated prematurely.

References: 1. Paksima N, Panchal A, Posner MA, Green SM, Mehtman CT, Hiebert R, et al, A meta-analysis of the literature on distal radius fractures; review of 615 articles. *Bull Hosp Jt Dis.* 2004; 62(1-2):40-6 2. Li SL, Gong XY. Evaluation of stability of distal radius fracture after conservative treatment. *Zhonghua Yi Xue Za Zhi*, 2006; 21;86(11):759-62 3. http://www.wheelsonline.com/ortho/colles_fr_x 4. Handoll HH, Madhok R. Conservative interventions for treating distal radial fractures in adults. *Cochrane database of Syst Rev.* 2003; (2): CD000314. Review 5. Blatter G, Papp P, Magerl F., A comparison of 2 methods of plastic cast fixation in treatment of loco classico radius fracture. A prospective, randomized study, *Unfallchirurg.* 1994; 97(10):534-40 6. Gupta A. The treatment of Colles' fracture. Immobilisation with the wrist dorsiflexed. *J Bone Joint Surg Br.* 1991; 73(2):312-5 7. Abbott LC, Saunders JB. Injuries of the median nerve in fractures of the lower end of the radius. *Surg. Gynecol. Obst.*, 1933; 57:507-516

Disclosure: No significant relationships.

PM048 Buzzsaw Injuries: Mechanisms of Damages And Predisposing Factors

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Introduction: Buzzsaw injuries cause serious damages to the phalanges and the hands with considerable secondary injuries and permanent affection of the function and the use of the hands. The goal of the present study is to identify possible predisposing factors and mechanisms which can lead to buzzsaw injuries, to be able to recommend effective prophylactic measures.

Material and Methods: Data were grasped from all patients with buzzsaw injuries which were treated between November, 2005 and September, 2008 in the clinic for accident surgery, hand surgery and restoration surgery of the Saarland university. Data to the accident procedure, to work conditions, safeguarding measures and injury kind were evaluated statistically.

Results: 44 male patients with buzzsaw injuries and an average age of 49 years were included. The most frequent injuries were traumatic amputations or partial amputations of single or several fingers (n = 22), followed by open fractures (n = 19) and mostly injuries of tendons (n = 10) and/or vessels / nerves (n = 6). Buzzsaws of different manufacturers and different price ranges were used. The

work conditions were well in all cases, the saws were placed firmly on the ground and the lighting was sufficient. Most injuries appeared on the week-end (Friday n = 9, Saturday n = 8). A break or a meal, taken shortly before the accident, had no influence on the injury risk. All patients had a several years lasting experience in dealing with buzzsaws, half of the patients even for at least 20 years. The safety device of the saw was folded back in most cases (n = 25), only few patients (n = 15) had correctly put on the saw safety device at the accident time, 4 patients provided more-over no information. The accident had entered in 12 cases shortly before working end, mostly with the last cut. In 10 cases a wooden piece had become stuck in the saw and the patient had tried to solve it.

Conclusion: A many years' routine in dealing with buzzsaws can lead to the fact that necessary safeguarding measures are not followed any more and so cause an increased injury risk. In particular shortly before working end the attention decreases and the injury risk rises. An especially injury-laden situation is becoming stuck of wooden parts in the saw. The attempt to solve these parts without switching off the saw before bears a high injury risk. The patients showed predominantly heavy injuries. This might be the result of our clinic as a university clinic. Patients with less severe injuries are concerned to be treated in smaller clinics next to their residence .

References: Justis EJ, Moore SV, LaVelle DG: Woodworking injuries: An epidemiologic survey of injuries sustained using woodworking machinery and hand tools. *J Hand Surg* 12A:890-895, 1987 Pechlaner S, Hussl H: Das Komplextrauma der Hand. *Orthopäde*, 27:11-16, 1998 Cheng HS, Wong LY, Chiang LF et al.: Comparison of methods of skeletal fixation for several injured digits. *Hand Surg* 9:63-69, 2004

Disclosure: No significant relationships.

PM049 Treatment of Distal Metaphyseal Femoral Fractures in Children (Case Report)

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Introduction: Majority of fractures in children is treated by closed reduction and casting, but femoral fractures are often indications for surgical treatment. The minimum amount of metal should be used, avoiding physeal plates if possible. I describe the case where external fixator proved to be a good alternative when K-wires fail.

Material and Methods: 11 years old boy suffered distal femoral fracture (AO 33-A2) in a car accident. Closed reduction and osteosynthesis with 4 K-wires were performed. Additional support was provided with a plaster cast. 2 weeks after surgery osteosynthesis failed. Cast and K-wires were removed. External fixator was used to maintain reduction. 2 Schanz-screws were inserted in the distal fragment at the superior and inferior aspect of the physeal plate. Another 2 Schanz-screws were inserted in the diaphysis and tube fixator was assembled.

Results: Osteosynthesis of distal metaphyseal femoral fracture with 4 K-wires and casting proved to be insufficient. External fixator showed reliable fixation and allowed knee movement immediately. It

was possible to insert Schanz-screws without penetrating the physal plate. The fracture healed 8 weeks after second surgery.

Conclusion: Considering proximity of physal plate in distal metaphyseal femoral fractures in children, external fixator is a strong alternative to other osteosynthetic materials.

Disclosure: No significant relationships.

PM050 Functional Outcome After Operative Treatment of Patellar Luxation in Adolescents

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Introduction: The traumatic patellar luxation in adult patients is operatively treated with medial reefing and lateral release. The value for the treatment of adolescents is still discussed controversially in literature. The aim of the present study was to evaluate the efficacy of the minimal-invasive treatment of traumatic patellar luxation in adolescents.

Material and Methods: 33 patients with a mean age of 15 years at the time of the operation were followed up for five years. The traumatic patellar luxations were treated with medial reefing and lateral release. The functional outcome of the patients was assessed with a subjective evaluation of pain (VAS), clinical functional scores (Lys-holm-, Tegner- and Kujala-Score), the SF-36 Medical Outcome Survey, the rate of reluxation after operative treatment and a radiologic evaluation.

Results: The patients experienced an early pain relief and good functional outcome. Complications such as reluxation were observed in one patient.

Conclusion: Medial reefing and lateral release is an efficient treatment for patellar luxation of adolescents. The patients are satisfied with their knee and showed a good functional outcome with a low incidence of complications.

References: Beasley LS, Vidal AF. Traumatic patellar dislocation in children and adolescents: treatment update and literature review. *Curr Opin Pediatr.* 2004 Feb;16(1):29-36. Review

Palmu S, Kallio PE, Donell ST, Helenius I, Nietosvaara Y. Acute patellar dislocation in children and adolescents: a randomized clinical trial. *J Bone Joint Surg Am.* 2008 Mar;90(3):463-70

Gerbino PG, Zurakowski D, Soto R, Griffin E, Reig TS, Micheli LJ. Long-term functional outcome after lateral patellar retinacular release in adolescents: an observational cohort study with minimum 5-year follow-up. *J Pediatr Orthop.* 2008 Jan-Feb;28(1):118-23

Zaidi A, Babyn P, Astori I, White L, Doria A, Cole W. MRI of traumatic patellar dislocation in children. *Pediatr Radiol.* 2006 Nov;36(11):1163-70. Epub 2006 Sep 12

Deie M, Ochi M, Sumen Y, Yasumoto M, Kobayashi K, Kimura H. Reconstruction of the medial patellofemoral ligament for the

treatment of habitual or recurrent dislocation of the patella in children. *J Bone Joint Surg Br.* 2003 Aug;85(6):887-90.

Disclosure: No significant relationships.

PM051 Operative Treatment of Pediatric Open Fractures of the Lower Limb Using the Taylor Spatial Frame Fixator

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Introduction: The operative management of open fractures of the lower limb requires a consistent treatment to avoid soft tissue complications. Acute angular shortening of the fracture enabling primary soft tissue closure is still an uncommon operative technique because of difficulties in correcting the secondary deformity.

Material and Methods: We report the case of a pediatric open fracture of the lower limb (Gustilo III° a), that was treated with acute angular shortening using a monolateral AO fixator followed by gradual correction using the Taylor Spatial Frame (TSF). The conversion in the TSF was achieved in exchanging only two half-pins.

Results: The deformity was anatomically corrected without any soft tissue complications. The fixator was worn for 12 weeks under full weight bearing while the actual correction took only 14 days. We did not see any typical external fixator complications like pin tract infection.

Conclusion: Acute angular shortening can lead to direct soft tissue closure without any additional plastic surgery. The accuracy the fixator allows the gradual anatomical reduction of the fracture and simplifies the correction of the mostly multiplanar deformities. When the surgeon is familiar with the TSF even a primary treatment of such fractures could be recommended.

Disclosure: No significant relationships.

PM052 Bilateral Sleeve Fracture of the Inferior Pole of the Patella in a Healthy Child

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Introduction: Bilateral sleeve fractures of the patella are rare. This is the second example in English literature of this occurring in a healthy child. Often the radiological findings are overlooked due to the cartilaginous injury being far larger than the fleck of bone avulsed. An unfortunate and frequent problem encountered with sleeve fractures is the timing of the diagnosis. Delay can result in sub-optimal management and outcome. We have written up this case report primarily as an interesting case report and literature review but principally to draw attention to the difficulties of diagnosis and treatment of this condition.

Material and Methods: A healthy 11 year old boy landed on a trampoline in his back garden and complained immediately of bilateral knee pain. Past medical, drug, family histories were all insignificant. He specifically had no history of anterior knee pain nor

was he hypermobile. Radiographs of the knees were suspicious of sleeve fractures and an MRI was organised. The MRI clearly revealed the extent of the displaced sleeve fractures. He underwent open reduction and internal fixation of the injuries within 24 hours using a transosseous suture technique. Three transosseous tunnels were drilled and Number 5 Ethibond was then used to anatomically oppose the ends of the sleeve fracture. The construct was reinforced with a circlage wire with the wire twisted so that it could be retrieved later through a small lateral incision. Post operatively the legs were immobilised in lightweight casting material for a period of 6 weeks followed by an unlocked hinged knee brace for 4 weeks. The circlage wires were removed at 6 months.

Results: The child now has full, pain free range of motion. The knee is stable and he has no functional problems.

Conclusion: We report a rare case and emphasize the timing of diagnosis as being crucial in outcome. Early operative intervention with accurate open reduction will yield good results. This publication serves to educate and refresh those who deal with general and paediatric lower limb trauma.

References: Houghton GR, Ackroyd CE. Sleeve fractures of the patella in children: a report of three cases. *J Bone Joint Surg Br* 1979;61-B:165-168. Ray JM, Hendrix J. Incidence, mechanism of injury, and treatment of fractures of the patella in children. *J Trauma* 1992;32:464-7. Wu CD, Huang SC, Liu TK. Sleeve fracture of the patella in children. A report of five cases. *Am J Sports Med* 1991;19:525-528. Goyal S, Sharma H, Singh GK, Richards S, Calvert P. Bilateral sleeve fracture of the patella in a healthy child. *Eur J Orthop Surg Traumatol* 2004;14:246-248. Gupta RR, Johnson A, Moroz L, Wells L. Patellar sleeve fractures in children: A case report and review of the literature. *Amer J Orthop* 2006;35/7:336-338. Gardiner JS, McInerney VK, Avella DG, Valdez NA. Injuries to the inferior pole of the patella in children. *Orthop Rev* 1990;19(7):417-418.

Disclosure: No significant relationships.

PM053 The Management of Triplane Fractures of Distal Tibia in Adolescents

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Introduction: The presentation of five patients in whom a relatively rare triplane fracture (7% of all distal tibial physeal injuries in children) had been treated at our hospital

Material and Methods: The cases of all patients who were seen and managed between January 2004 and December 2007 were reviewed. The image control (plain x-rays, CT) revealed and definitively determined whether a two-part or three part triplane fracture in the distal tibial physis were present, the amount of the displacement, and the co-existed fracture of the fibula. The principal goal must be the anatomical reduction of the fracture initially closed and in failure opened. An open reduction and fixation with 3 Steinmann via anterior approach followed. A long-leg cast worn for initial 4 weeks, followed by a short-leg cast for 2 weeks.

Results: At a minimum of fourteen months of clinical follow - up all patients lacked complaints and had full range of motion in ankle.

Conclusion: These injuries occur in the adolescent age group generally slightly younger than the child with a Tillaux fracture, needed good image control (CT) and must reduced anatomically and fixed.

Disclosure: No significant relationships.

PM054 Dynamisation is a very Important Method Influencing Bone Healing

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Introduction: Dynamisation plays very important role in bone healing. It is necessary in 15-25% of patients. To provide dynamisation using conventional methods, it is necessary to perform one additional surgery. In this presentation it is shown one new method of selfdynamisation.

Material and Methods: It is presented one new minimally invasive method for closed fracture reduction and one extramedullary self-dynamisable internal fixator. There is no contact between bone and internal fixator in fracture area. It has been widely investigated biomechanically. In clinical use it has been applied to 1,349 patients in treatment of femoral fractures. The age of patients was from 14 to 88 years. This internal fixator is applied by two small incisions. Reduction is achieved using standard traction table or using special reduction device. This reduction device provides possibility of reduction with minimal using of fluoroscopy or even, after more experience without using of any imaging technique as fluoroscopy, ultrasound or computer navigation.

Results: Received clinical results are promising, as it has been shown early callus formation and radiological union within the 3-4 months. It has been allowed to patients early full weight bearing. During the treatment it has been confirmed working of self-dynamisation concept (in 24% of patients), which probably all together with 3D configuration resulted in unexpectedly quick fracture healing. Follow up was 20 months (6-61).

Conclusion: According to results obtained, it can be concluded that new selfdynamisable internal fixator is suitable for minimally invasive technique, without opening of fracture site. Selfdynamisation feature is activated in case where union delay.

References: 1. M. Mitkovic, M. Bumbasirevic, Z. Golubovic, D. Mladenovic, S. Milenkovic, I. Micic, A. Lesic, V. Bumbasirevic, P. Pavlovic, S. Karalejic, G. Kuljanin, New biological method of internal fixation of the femur, *Acta Chir Iugosl*, 52(2005)113 2. M. Mitkovic, M. Bumbasirevic, Z. Golubovic, I. Micic, D. Mladenovic, S. Milenkovic, A. Lesic, V. Bumbasirevic, P. Pavlovic, S. Karalejic, G. Kuljanin, D. Petkovic, New concept in external fixation, *Acta Chir Iugosl*, 52(2005)107

Disclosure: No significant relationships.

PM055 Results of Electromagnetic Fields in Healing Progression of Delayed Union in the Lower Extremities

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Introduction: The purpose of this study was to evaluate the effect of electromagnetic fields in healing progression of delayed union of long bones in the lower extremities. We defined delayed union, as failure of expected healing progression and nonunion when a minimum of nine months has elapsed since injury and failure or halting of healing progression was observed in three successive monthly radiographs (infection ruled out).

Material and Methods: During 2007-2008 we treated 21 patients with 16 tibia (7 complex distal tibia, 5 transverse and 4 comminuted shaft fractures) and 5 femoral fractures with delayed union, with a device using electromagnetic fields for 30 minutes per day. The mean age of the patients was 37 years (range 22 to 72 years). 11 of the fractures were open type II and 5 type IIIa in Castillo's classification. 18 were smokers and 13 polytrauma patients. 13 were initially treated with external fixation, 6 with plating and 2 with intramedullary nailing. The average time after injury for treatment initiation was 4 months (3 to 6 month).

Results: Healing was achieved in 17 patients (81%) in an average time of 2,5 months (1,5 to 6 months) while the rest patients underwent a new surgical procedure 4 months after no sign of healing progression was observed. Healing was determined to be completed when at least three cortices were bridged in radiographs and no motion or pain was seen clinically at the fracture site. No complications and no adverse reactions were observed.

Conclusion: In cases of delayed union of carefully selected patients with many risk factors as smoking, severe osteoporosis, open fractures, severe complex fractures etc., use of electromagnetic fields seem to progress the healing process. That can save patients from a new surgical procedure with all the dangers and the complications that could be observed. However more randomized controlled trials or well-designed cohort studies are needed to determine the effectiveness of the use of electromagnetic fields in healing progression.

References: 1. K.J. McLeod, Clinton T. Rubin, The effect of Low-Frequency Electrical Fields on Osteogenesis, JBJS 1992 2. J.T. Ryaby, Biophysical Stimulation of Fracture Healing Mediated by IGF-II 3. R.J. Linovitz, Combined Magnetic Fields Accelerate and Increase Spine Fusion, Spine vol 27 N 13, 2002 4. J.T. Ryaby, Clinical effects of electrical and electromagnetic fields on fracture healing. Clin. Orthop 1998

Disclosure: No significant relationships.

PM056 Management of Segmental Lower Limb Loss by Rotationplasty

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Introduction: Lower limb traumatic amputations might pose a special challenge when neither weight bearing stump for prosthetisation can be shaped, nor conventional replantation can be performed due to the extent of injury. Rotationplasty used mostly in the field of tumor surgery in children offers a viable alternative under such circumstances to restore walking ability.

Material and Methods: A 26 year old female patient involved in a motor vehicle accident sustained a right femoral level traumatic amputation, pubic rami fractures, left hip fracture-dislocation, left lower leg segmental, compound fracture. Her right foot and ankle together with the distal tibia was recovered from the field. A short limb with weight bearing capability was created by rotationplasty. Branches of the deep femoral artery were employed for vascular anastomoses. The rest of her injuries were managed by staged surgeries.

Results: Prosthetic replacement of the amputated limb was possible six months after the injury. The patient regained her independent walking ability after nine months. Two years after the accident she underwent a total hip replacement on the opposite side due to avascular necrosis of the femoral head.

Conclusion: A functioning hip joint could be preserved and weight-bearing stump was created employing rotationplasty in a case of traumatic lower limb amputation which otherwise would have ended up in hip disarticulation. Possibility of rotationplasty should be kept in mind when facing lower limb amputations with extensive segmental damage.

Disclosure: No significant relationships.

PM057 Diagnostic and Therapeutical Problems in Crushing Trauma

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Introduction: Complete evaluation of trauma includes not only the injuries, but also the mechanism, suggesting the trauma energy. The purpose of this study is to establish a therapeutic protocol depending on clinical aspects in high energy trauma with crushing.

Material and Methods: This prospective study analyses 110 patients admitted in our hospital between 01.06.2006-01.06.2009 with a diagnosis including "crushing". The main clinical aspects of these cases were: fracture, crushing without fracture, open fracture, compartment syndrome (with or without fracture), acute peripheral ischaemia. The authors describe the algorithm for diagnosis (including laboratory findings and complementary examinations) and treatment (following MESS_Score) for these cases.

Results: In 64% of crushings of the shank compartment syndrome appeared, in 65% of the cases with fracture and 35% of cases with crushing without fracture. Fractures appeared in 82% of the cases, and open injuries only in 62% of the cases. 35% of the crushings produced complex trauma (vascular or nervous injury), acute peripheral ischaemia appeared after 28% of the crushings.

Conclusion: The crushing mechanism is associated with high energy trauma, which can produce severe injuries, with different clinical aspects. Initial correct diagnosis, followed by specific monitoring and treatment provides the favourable outcome of the patient. The recommended treatment is surgical- fasciotomy. The efficacy of the

treatment is reflected in decrease of fatal complications (renal failure, MSOF) and favorable local outcome.

References: Complex trauma of the limbs with vascular injuries- Olivera Lupescu, Mihail Nagea, Gheorghe Ion Popescu, Cristina Patru, Meteor Press, Bucharest, 2007

Disclosure: No significant relationships.

PM058 Do Undisplaced Stable Ankle Fractures Ever Displace – Are We Subjecting Our Patients to Unnecessary Radiation and Follow-Up Appointments?

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Introduction: To assess whether stable undisplaced ankle fractures treated conservatively with a below knee non weight bearing cast ever displace.

Material and Methods: Retrospective case notes analysis was performed. Between August 2007 and August 2009, one hundred and twenty one patients sustained a stable undisplaced ankle fracture which was treated conservatively. Their age range was from 16 to 86 years. Male to female ratio was 74:47. The mean number of clinic follow ups was 3.7. These patients were classified according to the Danis-Weber Classification for analysis. Thirty (25%) patients had Weber A1 fractures, seventy two (60%) had Weber B1 fractures, five patients (4%) had Weber B2 fractures, three patients (2%) had Weber C1 fractures, ten patients (8%) had isolated medial malleolus fracture and one patient suffered an isolated posterior malleolus fracture.

Results: An average of 4.7 x-rays were performed on each patient from the time of diagnosis to discharge from clinic. None of these fractures displaced on follow up x-rays.

Conclusion: Stable undisplaced ankle fractures treated conservatively with a below knee non weight bearing cast do not displace. Hence these patients do not require to be followed up frequently with serial x-rays as they may be exposed to unnecessary harmful radiation and follow up appointments thereby saving time, money and resources.

Disclosure: No significant relationships.

PM059 Bone Loss as a Cause of Non Consolidation, of Exposed Bimalleolar Fracture – Case Report

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Introduction: The authors present the case of 55 years old patient, victim of a farming accident which caused a exposed bimalleolar fracture (Gustillo III B) of the right ankle, with soft tissue and bone loss.

Material and Methods: The wound was washed, and debrided. A plaster slab was made. The patient was admitted to the hospital and discharged only after soft tissue healing.

Results: Four months after the accident, the x-ray showed delayed consolidation, with atrophic callus, mainly in the fibular malleolus, due to local bone loss. It was then decided to intervene surgically. Autologous uncortical iliac bone graft was harvested for completion of the fibular bone defect, followed by stabilization with a plate and screws. Iliac trabecular bone was placed in the tibial fracture, followed by osteosynthesis with screw.

Conclusion: The authors present this case with a follow-up of 2 years, showing the clinical and radiological results.

Disclosure: No significant relationships.

PM060 Clinical Audit of Post-Operative Complications After Open Reduction and Internal Fixation of Intra-Articular Calcaneal Fractures in Relationship to Institutional Volume Load Data

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Introduction: In the Netherlands, approximately 60% of all intra-articular calcaneal fractures is treated operatively, mainly using the open reposition and internal fixation (ORIF) method. Superficial and deep wound infection, osteomyelitis, and osteo-arthritis represent the main group of post-operative complications. It has been demonstrated that outcome after ORIF for intra-articular calcaneal fractures may be reflected by the institutional trauma care and fracture volume (1). We aim to describe the rate of postoperative complications after calcaneal plate osteosynthesis in relation to the hospital fracture load as a means to increase insight into the clinical audit data.

Material and Methods: A search was performed using the disease code for intra-articular calcaneal fractures and operative code for ORIF for the period 2000-2009. The medical records of all included patients were obtained. As postoperative complications we included superficial and deep wound infection, mobilisation problems with need for orthopaedic shoes or walking aid and secondary arthrodesis. Current complication rate of deep infection and arthrodesis rate from the clinical audit were compared with the mean logarithmic correlation coefficient relating complication rates with the institutional fracture load data, reported earlier in the literature (1).

Results: Over a period of 108 months a total of 53 intra-articular calcaneal fractures were reconstructed with a calcaneal plate using ORIF (mean institutional fracture load = 0.49 fractures per month). Eight patients had a wound infection, six of them were treated with antibiotics and two of them needed surgical debridement. Thirteen patients have mobilisation problems, 5 patients suffered from pain when walking, 7 patients used orthopaedic shoes and one patient mobilised using a wheelchair. Two patients had an secondary arthrodesis (n = 2, 3.8%). In seven patients the osteosynthesis was removed due to pain. Both deep infection rate and arthrodesis rates related to the institutional fracture load were below the 95% CI reported in the literature.

Conclusion: The outcome of open reduction and internal fixation of intra-articular calcaneal fractures is known to be determined not only by factors related to patient and the fracture, but also to the institutional fracture load (1). The complication rate regarding deep wound infection and arthrodesis is below the data reported in the literature, related to the institutional fracture load. Clinical audits studying the complication rate should take the institutional fracture load into account.

References: 1. J. Bone and Joint Surg Am, 2008 May; 90(5). M Poeze. The relationship between the outcome of operatively treated calcaneal fractures and institutional fracture load.

Disclosure: No significant relationships.

PM061 Demographics and Outcome of Fractures of the Toes

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Introduction: Toe fractures are the most common fracture of the foot. There is little data on demographics and no studies on functional outcome of toe fractures.

Material and Methods: The initial radiographs of all consecutive patients with toe fractures treated between January 2006 and September 2008 at the Reinier De Graaf Groep in Delft, the Netherlands were re-evaluated; patient and fracture characteristics were collected. All patients in aged 16 to 75 (264 patients) were sent a questionnaire concerning pain, activity and functional limitations, footwear, walking distance, and gait (AOFAS midfoot score). Overall satisfaction was measured using a Visual Analogue Scale (range zero to ten).

Results: A total of 339 patients with 368 digital and 370 phalangeal fractures of the foot were identified. The distribution of fractured toes was: first 38%, second 11%, third 7%, fourth 14%, and fifth 30%. Multiple digital fractures were seen in 5.9%. Most fractures were caused by stubbing the toe or a crush injury (75.6%). More than 95% of the fractures were undisplaced or minimally displaced and most fracture patterns were transverse or oblique/spiral.

A total of 141 patients (53%) returned the questionnaire with a median follow-up of 27 months. Responders were female in 57.4% and had a median age of 45 years (P25-P75 31-58). In 46.8% of cases the left side was affected. The median AOFAS-score was 100 points (P25-P75 93-100), the median VAS was 10 points (P25-P75 8-10). No correlations were identified with outcome and which toe or phalangeal bone was affected, number of fractured toes, fracture type and location, articular involvement, gender, age, body mass index, smoking habits, and diabetes. In the univariate analysis a trend was found for dislocation and AOFAS score ($p = 0.058$). In the multivariate analysis the VAS was dependent of age ($p = 0.047$) and gender ($p = 0.049$). The AOFAS midfoot score was not influenced by any of the parameters.

Conclusion: This is the first investigation using two validated outcome scoring systems to determine functional outcome. Almost all

toe fractures were healed without complaints at 27 months. Patient satisfaction is slightly less in younger female patients.

Disclosure: No significant relationships.

EMERGENCY SURGERY

PT001 Carcinoid Tumors of Appendix; In 1969 Appendectomised Cases

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Introduction: Presenting of incidence of the carcinoid tumors in emergency appendectomy series and long period results is aimed.

Material and Methods: Between March 2002-March 2009, our series is examined retrospectively. Our parameters are demographic and clinical properties, intraoperative signs, histopathologic feature and post-operative controls.

Results: The series contains 5 cases in 1969 appendectomies. Female/Male ratio is 4/1. Carcinoid tumor incidence is 5/1969 (0.25%). Average age is 32.8 (16-49). All cases had clinical feature of acute appendicitis. Tumors were located tip of the appendix in 4 cases and 1/3 middle portion of appendix in one case. Mean measure of tumors was 0.58 (0.2-1.4) cm. Additional surgical procedure was not applied. At the end of mean follow-up period (20 month), the cases have not any disease, all cases are alive.

Conclusion: The appendix has been one of the most common site of carcinoid tumors (1). Carcinoid tumor is seen incidental in appendectomised cases (0.3-0.9) and frequently in female (2,3). Mean diagnosis age is between 39-49 in literature, whereas in our series it is 32 (4). Postoperative living prognosis is good in incidental carcinoid tumors of appendix (5). In our cases, additional surgical procedure was not applied because tumor is less than 2 cm, mesoappendix is healthy, and vascular invasion was not seen in histopathologic examination.

References: 1. Modlin IM, Lye KD, Kidd M. A 5-decade analysis of 13715 carcinoid tumors. Cancer. 2003;97:934-59. 2. Goede AC, Caplin ME, Winslet MC. Carcinoid tumours of the appendix. Br J Surg. 2003;90:1317-22. 3. Tachana-Sato V, Detry O, Polus M, Thiry A, Detroz B et al. Carcinoid tumor of the appendix: a consecutive series from 1237 appendectomies. World J gastroenterol. 2006;12:6699-701. 4. Sandor A, Modlin IM. A retrospective analysis of 1570 appendiceal carcinoids. Am J Gastroenterol. 1998;93:422-8. 5. In't Hof KH, van der Wal HC, Kazemier G, Lange JF. Carcinoid tumour of the appendix: an analysis of 1485 consecutive emergency appendectomies. J Gastrointest Surg. 2008;12:1436-8.

Disclosure: No significant relationships.

PT002 Diverticulum Meckels-Cause of Ileus

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Introduction: Meckel's diverticulum is a true intestinal diverticulum that results from the failure of the vitelline duct to obliterate during the fifth week of fetal development. Meckel's diverticulum is a small pouch on the wall of the lower part of the small intestine and is usually present at birth. It occurs in about 2% of the population. Most people who have a Meckel's diverticulum have no symptoms or problems. One complications of Meckel's diverticuloma and obstruction.

Material and Methods: The surgical clinic C.H.C Pristina in Gracanica in the period 2004 to 31.08.2009. year work's the 2.745 surgery on abdominal organs .Meckel's divertikul was found in 4 or 0.15% cases. Patients were aged 12,15 and 20 yrs

Results: Cause obstruction was in 3 ili75, 0% cases. All the patients operated under a clinical picture of ileus-acute abdomen. Because intestinal gangrene in 2 or 50% of cases there is a small bowel resection with T-T anastomosis, and 1 or 25% of cases diverticulectomy. Postoperative complications did not have

Conclusion: With abdominal pain, especially ileocaecal region, with the young people should think and Meckel' diverticulum.

Disclosure: 1.Surgical Clinic, C.H.C. Pristina-Gracanica, Serbia 2.Pediatric Clinic.C.H.C.Pristina-Gracanica,Serbia Meckel's diverticulum is a true intestinal diverticulum that results from the failure of the vitelline duct to obli

PT003 Pure Meckels Diverticulitis in Clinical Spectrum of Acute Appendicitis, Case Report

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Introduction: For clinical importance, two cases are presented who were operated with diagnosis of acute appendicitis. Intraoperatively, appendixes were normal, for this reason meckel's diverticulas were explored and diverticulitis were seen.

Material and Methods: Two cases are explored retrospectively

Results: Case 1: The case is 40 years old male patient. He admitted to emergency department with abdominal pain for 2 days. There were defans and rebound on the right inferior quadrant of the abdomen. Leucocytosis ($15,0 \times 10^3/\text{mm}^3$), aperistaltic intestinal ans in ultrasonographic examination were seen. In the operation appendix was normal, so meckel's diverticula researched and diverticulitis was seen at 80th cm from ileocecal valve. Wedge resection for diverticulitis and appendectomy for appendix were performed. In microscopic pathologic examination appendix was normal, and meckel's diverticulitis was seen Case 2: The case is 32 years old male. He admitted to emergency department with abdominal pain for 3 days because his pain increased last 2 days. He has nausea, vomiting, fever ($38,3^\circ\text{C}$), leucocytosis ($16,0 \times 10^3/\text{mm}^3$), defans and rebound on the right inferior abdomen. In the operation appendix was normal, so meckel's diverticula researched and diverticulitis was seen at 100th cm from ileocecal valve. Wedge resection for diverticulitis and appendectomy for appendix were performed. In microscopic pathologic examination appendix was normal, and meckel's diverticulitis was seen.

Conclusion: Meckel's diverticula is the most congenital anomalies of the gastrointestinal anomalies and it was found 2% in autopsy ser-

ies. (1). It is asymptomatic generally. Risk of complication is 4-6% (2). Preoperative diagnosis may not be done frequently, so to delay of operation may be serious complication. (3) In our clinic, we explore meckel's diverticula, over (in female) and duodenum, if we do not see purulent material on the appendix.

References:

1. Mackey WC, Dineen P. A fifty-year experience with Meckel's diverticulum. *Surg Gynecol Obstet* 1983;156:56-64. 2. Cullen JJ, Kelly KA, Moir CR, Hodge DO, Zinsmeister AR, Melton LJ 3d. Surgical management of Meckel's diverticulum. An epidemiologic, population-based study. *Ann Surg* 1994;220:564-9. 3. Korkmaz O, Yilmaz G, Keles C, .EriÅYkinlerde görülen meckel divertikül komplikasyonlarÅ ± .*Türkiye Klinikleri TÅ ± p Bilimleri Dergisi* 2007; 27(4):518-521

Disclosure: No significant relationships.

PT004 Intestinal And Peritoneal Tuberculosis – A Surgical Reality

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Introduction: Abdominal tuberculosis has different clinical presentations and can be confused with other conditions. Abdominal tuberculosis (TB) is a rare disease, with non-specific findings.

Material and Methods: The records of 11 patients (3 males, 8 females, mean age 49 years, range 16-55 years) diagnosticated with abdominal tuberculosis in Clinical Emergency Hospital Bucharest between January 2000 and December 2008 were retrospectively analyzed.

Results: Patients with abdominal TB were diagnosed by laparoscopy and peritoneal biopsy in 9 cases and by laparotomy in 2 cases. From these 11 patients we observed peritoneal TB in 8 cases, intestinal TB in 2 cases, mesenteric lymph nodes TB in 1 case. At admission 5 patients presented complications: 2 cases with perforations and peritonitis, 1 case with intestinal obstruction and 2 cases presented as ileo-cecal "tumors" (solved by right colectomy); other surgical procedure performed was enterectomy with either entero-entero-anastomosis, either ileo-colic anastomosis. In abdominal tuberculosis ascites was present in 8 cases. Other common findings were weight loss (6 cases), weakness (4 cases), abdominal pain (10 cases), anorexia (8 cases) and night sweat (2 cases). Only 2 patients had chest radiography suggestive of a new TB lesion. In those patients with peritoneal tuberculosis subjected to operation, the findings were multiple diffuse involvements of the visceral and parietal peritoneum, white "miliary nodules" or plaques, enlarged lymph nodes, ascites, "violin string" fibrinous strands, and omental thickening. Biopsy specimens revealed granulomas, while ascitic fluid showed numerous lymphocytes. Postoperative management was applied by the TB Medical System. All patients were treated for 6 months by specific drug therapy, with favorable evolution. PCR of ascitic fluid was positive for *Mycobacterium tuberculosis* (M. tuberculosis) in all cases.

Conclusion: Abdominal TB should be considered in all cases with ascites. Our experience suggests that PCR of ascitic fluid obtained by ultrasound-guided fine needle aspiration is a reliable method for TB diagnosis and should be attempted before surgical intervention.

References: 1. Uzunkoy A, Harma M, Harma M. Diagnosis of abdominal tuberculosis: experience from 11 cases and review of the literature. *World J. Gastroenterol.* 2005 Jun 7;11(21):3328. 2. Vardareli E, Kebapci M, Saricam T, Pasaoglu O, Açikalin M. Tuberculous peritonitis of the wet ascitic type: clinical features and diagnostic value of image-guided peritoneal biopsy. *Dig. Liver Dis.* 2004 Mar;36(3):199-204.

Disclosure: No significant relationships.

PT005 Relaparotomies in General Surgery

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Introduction: In some patients, relaparotomy must be made for therapy of complication after abdominal surgical intervention. In second or third abdominal reoperations, risk of the surgery is higher than primer operation. In our clinic we encounter this problems in our series and this problems are presented.

Material and Methods: The cases with relaparotomy are explored retrospectively between January 2005-January 2009. Our criterias are age, gender, causes of relaparotomy, distribution of the cases, multiple relaparotomies and mortality. The all cases have urgent unplanned relaparotomies. Planned relaparotomies are excepted in this series.

Results: Our urgent, unplanned relaparotomy (RL) number is 45. RL ratio is 1,2% in 3833 cases. The case number with RL is 41. Average age is 48,2. Female/male ratio is 17/28. Causes of RLs were gastrointestinal (GIS) fistulas in 16 RL, brid ileus in 2 RL, intraabdominal hemorrhagies in 7 RL, evisceration in 12 RL, extrahepatic biliary fistulas in 7 RL, intraabdominal foreign body in one RL (Some portion of the drain stayed in the abdomen because it ruptured when it was extracted). Two or more RLs were made in 3 cases. The average day between first (primary) and second (relaparotomy) is 8 days in biliary fistulas, 1,8 days in hemorrhagies, 8,75 days in GIS fistulas, 10,2 days in evisceration, 5 days in brid ileus. Mortality ratio is 26%. The most causes of mortality is sepsis and multiple organ failure. The longest interval time was seen in evisceration group but the most number of mortal cases was seen in GIS fistulas group in our series.

Conclusion: RL means that carried out within 60 days after first laparotomy. (1) RLs have high mortality rates. (2) In the first operation, surgeon must be in meticulous working if he does not want to relaparotomies. (3) Urgent RL decision must be based on clinical findings and this decision must be done by experienced surgeons. RL time may prevent death from postoperative complications of the patient-s. (4) Fight with infection is the most important factor in our opinion.

References: 1. Giregov SG, Petrov VA, Grigoreva TS. Relaparotomy. Problems of terminology. *Khirurgia* 2003;6:60-62 2. Blunt TJ. Urgent relaparotomy: the high-risk, no-choice operation. *Surgery*. 1985;98(3):555-60 3. Unalp HR, Kamer E, Kar H, Bal A, Peskersoy M, Onal MA. Urgent abdominal reexplorations. *World Journal of Emergency Surgery* 2006;1:10 4. Shchepotin IB, Evans SR, Chorn VA, Shabahang M, Buras RR, Nauta RJ. Postoperative complications requiring relaparotomies after 700 gastrectomies performed for gastric cancer. *Am J Surg*. 1996; 171(2):270-3

Disclosure: No significant relationships.

PT006 Treatment of Ulcus Perforans

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Introduction: Perforation is an acute complication of the ulcer disease that appears as the result of penetration of the ulcer crater into free abdomen. Aim of the work is to point at the importance of the early diagnosing and starting with adequate medical treatment.

Material and Methods: The material of the Surgical Clinic KBC Prishtina was used for this work. 222 patients treated for perforated ulcer were analyzed by retrospective study.

Results: Perforated ulcer is, after bleeding, the most frequent complication of the ulcer disease. We have found perforated ulcer at 210 (94,59%) male patients and at 12 (5,41%) female ones. Perforation was mostly frequently found at duodenum at 192 (86,49%) and than at jejunum at 2 (0,90%) patients. Pneumoperitoneum was also verified at 182 (81,92%) patients, palpation disease in epigastrium at 195 (87,84%), coercive knee-elbow position at 216 (97,30%) and musculature defence of abdominal wall at 217 (97,75%) patients. Perforated ulcer was treated surgically at 216 (97,30%) patients, while at six of them (2,70%) Taylor conservative treatment methods were used. At perforated ulcer treatment, suture of the place of perforation was used at 205 (94,91%) people, Billroth II stomach resection at six (2,78%), suture of the place of perforation with PSV at three (1,39%), and Billroth I stomach resection at one (0,46%) patient. Postoperative complications were noticed at 14 (6,48%) people. We had postoperative mortality at four (1,85%) patients. Recidive ulcer was registred at 10 (4,63%) patients who were surgically treated for perforated ulcer before.

Conclusion: Ulcer perforation is an acute complication of the ulcer disease that appears most frequently after bleeding and which usually requires surgical treatment.

References: 1. Behçet disease complicated by a perforated ileal ulcer presenting as an acute abdominal emergency. Tsai HM, Lin BW, Jin YT, Weng CT, Wang CR. *J Clin Rheumatol.* 2009 Sep;15(6):321. 2. Perforated gastric and duodenal ulcers in an urban African population. Ohene-Yeboah M, Togbe B. *West Afr J Med.* 2006 Jul-Sep;25(3):205-11. 3. Perforated peptic ulcer: use of pre-admission oral glucocorticoids and 30-day mortality. Christensen S, Riis A, Nørgaard M, Thomsen RW, Tønnesen EM, Larsson A, Sørensen HT. *Aliment Pharmacol Ther.* 2006 Jan 1;23(1):45-52. 4. Gastro-duodenal ulcers with perforation caused by short-term acetylsalicylic acid ingestion: case report Culafić D, Matejić O, Rudić J. *Srp Arh Celok Lek.* 2009 May-Jun;137(5-6):282-4. Serbian. 5. Perforation and haemorrhage duodenal bulbar ulcers in a child: a case report] Ngom G, Diouf ML, Fall M, Konaté I, Sankalé AA, Diop M, Fall I, Ndoeye

M. Dakar Med. 2008;53(1):28-31. French. 6. Perforated gastroduodenal stress ulcer Melinte C, Dragomir C. Rev Med Chir Soc Med Nat Iasi. 2006 Jul-Sep;110(3):604-8. Romanian.

Disclosure: No significant relationships.

PT007 Non-Operative Management of Hemoperitoneum From Spontaneous Non-Megalic Splenic Rupture in Primary Amyloidosis. Case Report and Literature Review

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Introduction: Splenic rupture is generally caused by traumatic mechanisms, while spontaneous splenic rupture (SSR) is an uncommon condition due to splenic diseases like tumors or infiltrative disorders. Although SSR causing hemoperitoneum is almost exclusively associated with splenomegaly, non-traumatic splenic rupture can seldom occur in non-megalic organs of patients with underlying infiltrative disorders, cancer or infections. From a literature review, to date there are no described cases of hemoperitoneum from non-megalic SSR due to amyloidosis treated with conservative measures.

Material and Methods: A 59 years old man presented with acute abdomen and severe anemia; CT scan revealed hepatomegaly with diffuse infiltrative signs and hemoperitoneum due to grade II-III splenic rupture. Clinical history was negative for trauma or known systemic diseases. Patient was treated with colloids-crystalloids fluid infusion, blood transfusion (2 units), oxygen administration and electrolyte re-equilibration until clinical parameters were considered stable. Liver biopsy was then performed showing massive infiltration of amyloid deposits. After four days from admission, once considered hemodynamically stable, the patient was referred for specific medical treatment.

Results: Amyloidosis, infections and other systemic diseases like solid and lymphatic tumors can cause SSR even in absence of splenomegaly. This condition is also burdened by a high rate of mortality. In such cases conservative treatment can lead to a better patients outcome reducing surgical-related morbidity and mortality, overwhelming post splenectomy syndrome rate and favoring a prompt treatment of the underlying disease.

Conclusion: Conservative treatment should be recommended in hemodynamically stable patients presenting with SSR due to infiltrative or infective disorders.

References:

Atraumatic splenic rupture in amyloidosis. Renzulli P, Schoepfer A, Mueller E, Candinas D. Amyloid. 2009 Mar;16(1):47-53. Review. PMID: 19291515 [PubMed - indexed for MEDLINE] Splenic rupture in systemic amyloidosis - case presentation and review of the literature. Skok P, Knehtl M, Ceranić D, Glumbić I. Z Gastroenterol. 2009 Mar;47(3):292-5. Epub 2009 Mar 11. Review. PMID: 19280544

[PubMed - indexed for MEDLINE] Spontaneous atraumatic rupture of a normal-sized spleen due to AL amyloid angiopathy. Chau EM, Chan AC, Chan WK. Amyloid. 2008 Sep;15(3):213-5. PMID: 18925461 [PubMed - indexed for MEDLINE] Spontaneous rupture of the spleen as immediate complication in autologous transplantation for primary systemic amyloidosis. Fernández de Larrea C, Cibeira MT, Rovira M, Rosiñol L, Esteve J, Bladà J. Eur J Haematol. 2008 Feb;80(2):182-4. Epub 2008 Jan 1. PMID: 18081703 [PubMed - indexed for MEDLINE] [Rupture of the spleen. Clinicopathological correlations and diagnostic procedures] Tzankov A, Adams H, Sterlacci W. Pathologe. 2008 Mar;29(2):148-57. German. PMID: 17929019 [PubMed - indexed for MEDLINE] Spontaneous rupture of the spleen in secondary amyloidosis: a patient with rheumatoid arthritis. Aydinli B, Ozturk G, Balik AA, Aslan S, Erdogan F. Amyloid. 2006 Sep;13(3):160-3. PMID: 17062382 [PubMed - indexed for MEDLINE] [Spontaneous splenic rupture due to amyloidosis] Di Stilio G, Kirmayr K, Nine C, Serrano F, Heinzelmann E, Catalano HN. Medicina (B Aires). 2005;65(2):151-3. Spanish. PMID: 16075811 [PubMed - indexed for MEDLINE] Spontaneous rupture of the spleen in AL amyloidosis. Oran B, Wright DG, Seldin DC, McAneny D, Skinner M, Sancherawala V. Am J Hematol. 2003 Oct;74(2):131-5. Review. PMID: 14508801 [PubMed - indexed for MEDLINE] Spontaneous splenic rupture—a rare complication of amyloidosis. Khan AZ, Escofet X, Roberts KM, Salman AR. Swiss Surg. 2003;9(2):92-4. PMID: 12723290 [PubMed - indexed for MEDLINE] Delayed splenic rupture as a cause of haemoperitoneum in a CAPD patient with amyloidosis. Dedi R, Bhandari S, Sagar PM, Turney JH. Nephrol Dial Transplant. 2001 Dec;16(12):2446. No abstract available. PMID: 11733652 [PubMed - indexed for MEDLINE] Liver transplantation as rescue treatment in a patient with primary AL kappa amyloidosis. Nowak G, Westermarck P, Wernerson A, Herlenius G, Sletten K, Ericzon BG. Transpl Int. 2000;13(2):92-7. PMID: 10836644 [PubMed - indexed for MEDLINE] [Spontaneous splenic rupture as an unusual presentation of primary amyloidosis] Tamarit García JJ, Boluda García F, Calvo Catalá J, Campos Fernández C, Parra Rodríguez JV, González Cruz MI, Herrera Ballester A. Rev Esp Enferm Dig. 1999 Sep;91(9):653-4. Spanish. No abstract available. PMID: 10502715 [PubMed - indexed for MEDLINE]

Disclosure: No significant relationships.

PT008 The Role of Laparoscopy in Abdominal Trauma in Children. Our Experience and Literature Review

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Introduction: Abdominal trauma represents an important cause of morbidity and mortality in children. Conservative management is preferred in blunt trauma with hemodynamic stability although there is a risk of intestinal damage when free fluid without solid organ injury is found in image studies. Early laparotomy may be unnecessary in most cases but a delay in diagnosis of bowel perforation could lead to increased rate of complications. On the other hand the presence of a penetrating abdominal trauma is considered an absolute indication of laparotomy. We present five cases of abdominal

trauma treated in our department in which laparoscopy proved to be an optimal diagnostic and therapeutic tool.

Material and Methods: Chart review of our cases and literature review

Results: Three cases of blunt abdominal trauma underwent laparoscopy. We found a small bowel perforation in one case that was repaired by externalization of the jejuna loop by one of the ports. In the other two cases we found intestinal and mesenteric contusions that were treated by peritoneal drainage. Two cases of penetrating trauma underwent laparoscopy. One of them presented omentum evisceration with no other injuries and the second presented a gastric perforation that needed reconversion to laparotomy.

Conclusion: In our experience and according to literature, laparoscopy should be taken into account as a diagnostic procedure in blunt abdominal trauma in stable children with abnormal abdominal examination and moderate free fluid and no solid organ injury in image studies, and it could be a first and sometimes definitive approach to minimal penetrating abdominal trauma.

References: Cunningham MA, Tyroch AH, Kaups KL, Davis JW. Does free fluid on abdominal computed tomographic scan after blunt trauma require laparotomy? *J Trauma*. 1998 Apr;44(4):599-602. Ng AK, Simons RK, Torreggiani WC, Ho SG, Kirkpatrick AW, Brown DR. Intra-abdominal free fluid without solid organ injury in blunt abdominal trauma: an indication for laparotomy. *J Trauma*. 2002;52(6):1134-40. Beierle EA, Chen MK, Whalen TV, Doolin EJ. Free fluid on abdominal computed tomography scan after blunt trauma does not mandate exploratory laparotomy in children. *J Pediatr Surg*. 2000;35(6):990-2. Venkatesh KR, McQuay N Jr. Outcomes of management in stable children with intra-abdominal free fluid without solid organ injury after blunt abdominal injury. *J Trauma*. 2007;62(1):216-20. Ulman I, Avanoglu A, Ozcan C, Demircan M, Ozok G, Erdener, A. Gastrointestinal Perforations in Children: A Continuing Challenge to Nonoperative Treatment of Blunt Abdominal Trauma. *J Trauma*. 1996;41(1):110-3.

Disclosure: No significant relationships.

PT009 A Procedure Requiring Quick Decision Making: Conversion From Laparoscopic to Open Cholecystectomy

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Introduction: As a result of increased surgical experience and technical developments, the indications for laparoscopic cholecystectomy treatment have extended even in complicated patients. Nevertheless, conversion to open cholecystectomy is required in cases for whom laparoscopic cholecystectomy cannot be safely proceeded and/or there are intraoperative complications. The present study aims to identify the preoperative risk factors in cases in whom conversion from laparoscopic to open cholecystectomy is performed and to reveal the intraoperative causes.

Material and Methods: Retrospective examinations were made on a total of 370 patients who underwent laparoscopic cholecystectomy and 23 patients among them in whom conversion to open cholecystectomy was performed.

Results: Dissection difficulty due to acute cholecystitis ranked first among the causes for conversion from laparoscopic to open cholecystectomy in 7(30.4%) patients. Other causes include difficulty in preparing Callot's triangle in 4 (17.3%) patients, biliary tract injury in 3 (13.04%) patients, multiple stones in the abdomen due to perforation in 2 (8.6%) patients, inadequate technical equipment in 2 (8.6%) patients, liver injury in 1 (4.3%) patient, intraoperatively detected umbilical hernia in 1 (4.3%) patient, uncontrollable bleeding in trocar entry site in 1 (4.3%) patient, insufficient insufflation in 1 (4.3%) patient, and unstoppable bleeding of arteria cystica in 1 (4.3%) patient, respectively.

Conclusion: Although laparoscopic cholecystectomy is the golden standard of treatment in cholecystectomy, it involves the risk of conversion to open surgery. The rate of conversion to open surgery has been reported to be between 2-20% in many series and is considered to be 5% on average. In our study, we found it as 6.2%, a rate which is close to the rate reported in the literature. Chief reasons for conversion from laparoscopic to open cholecystectomy include the difficult dissection of Callot's triangle due to obscured anatomy and adhesions, gallbladder perforation, bleeding, the failure to produce pneumoperitoneum, gallbladder cancer, and injury in main biliary tracts and neighboring organs. The presence of pericholecystic adhesion and liquid in acute cholecystitis cases and the presence of edema in the tissue affect regional anatomy and complicate dissection, which increases the risk of gallbladder perforation. In our study, changes due to acute cholecystitis and difficulties in the preparation of Callot's triangle ranked first among the indications for open cholecystectomy with a rate of 47.8% (11/23). Conversion from laparoscopic to open cholecystectomy is not a failure; on the contrary, it is a procedure indicated for the safe completion of operations that cannot be completed by the laparoscopic method and it requires quick decision.

Disclosure: No significant relationships.

PT010 Laparoscopic Approach in Acute Cholecystitis: 4 Year Experience

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Introduction: Laparoscopic approach for acute cholecystectomy is not universally accepted as gold standard treatment because of its higher rate of morbidity and conversion to open surgery.

Material and Methods: We report a four years experience on 167 cases of acute, istopatologically confirmed, cholecystitis treated laparoscopically. We divided the patient in three group: acute (49,1%), empiematosi (27,6%) and gangrenous (23,3%) cholecystitis.

Results: We did not found any significant difference in complication rate comparing with literature. Our overall conversion rate is 3.5% all due to incomplete visualisation of the Calot's triangle. No conversion were performed in the "acute" cholecystitis group.

Conclusion: We think that laparoscopy is a useful instrument in the treatment of acute cholecystitis. Conversion to laparotomy must be considered when anatomy is unclear but increases morbidity rate and hospitalization.

References: S. Kitano et al.: "Laparoscopic cholecystectomy for acute cholecystitis". *J Hepatobiliary Pancreat Surg* (2002) 9:534–537
Schirmer BD, Edge SB, Dix J, Hyser MJ, Hanks JB, Jones RS (1991) Laparoscopic cholecystectomy: treatment of choice for symptomatic cholelithiasis. *Ann Surg* 213:665–676
Zucker KA, Flowers JL, Bailey RW, Graham SM, Buell J, Imbembo AL (1993) Laparoscopic management of acute cholecystitis. *Am J Surg* 165:508–514
Kum CK, Eypasch E, Lefering R, Math D, Paul A, Neugebauer E, Troidl H (1996) Laparoscopic cholecystectomy for acute cholecystitis: is it really safe? *World J Surg* 20:43–49

Disclosure: No significant relationships.

PT011 Treatment of the Open Abdomen: Delayed Primary Closure by Means of VAC®-Therapy and Mesh-Mediated Fascial Traction? A Pilot Study

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Introduction: Treatment of the open abdomen remains a complex and challenging surgical problem. Laparostomy treatment is associated with high morbidity and mortality numbers. It is crucial that delayed primary fascial closure follows as early as safely possible. Many temporary abdominal closure (TAC) techniques have been proposed, however no clear consensus exists about the best method of treatment.

Material and Methods: 7 patients were treated combining VAC®-therapy with temporary mesh-mediated fascial traction (VAC®-mesh technique). Every 4 days the VAC® dressing was changed and the mesh tightened until delayed fascial closure was achieved.

Results: 5 out of 7 patients suffered from severe peritonitis. The delayed primary fascial closure rate was 71,4 % Median number of VAC®-changes was 3, average duration of open abdominal treatment was 19 days. In-hospital mortality was 42,9 %, all resulting from multiple organ failure. Respiratory complications were common. 1 patient (14,3 %) developed an enterocutaneous fistula before VAC®-mesh application and was successfully managed with the VAC®-fistula technique. 14,3 % developed an intra-abdominal abscess following a necrotizing pancreatitis. One case was complicated with a leaking bowel anastomosis which did not result from the VAC®-mesh technique.

Conclusion: This pilot study proves that TAC with the VAC®-mesh technique is both safe and feasible. Limited conclusions can be made concerning the superiority of the system compared to other closure methods. The technique might be especially helpful to achieve DPC in patients with prolonged open abdominal treatment and extensive loss of abdominal domain. Mortality and morbidity numbers were acceptable considering the severe underlying pathology. Long term results and further randomized clinical trials are warranted.

Disclosure: No significant relationships.

PT012 Open Management of Infected Pancreatic Necrosis – Inter Pulse Jet Irrigation and Modified Vacuum Mesh-Foil Laparostomy

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Introduction: The most difficult decision in the management of the patients with severe necrotizing pancreatitis is whether surgery is required and which of the complementary approaches to necrosectomy and drainage is appropriate. Recently a great deal of data has emerged suggesting that a pulsating irrigation stream delivered at high pressure and with a high flow effectively decreases bacteria, foreign bodies, and necrotic crushed tissue in wounds and decreases the incidence of resultant wound infection. This study evaluates the effect of Inter pulse jet irrigation, used for the first time in open abdominal surgery.

Material and Methods: Twelve patients presenting proven infected/non-infected pancreatic necrosis during course of acute pancreatitis and not responding to radiological or laparoscopic drainage were prospectively offered necrosectomy using inter pulse jet irrigation. Open necrosectomy and subsequent jet irrigation were performed using a midline laparotomy. In all patients, 1 to 3 tube drainages were placed during necrosectomy for continuous closed lavage. Temporary abdominal closure using modified mesh-foil laparostomy was applied for relief of abdominal compartment syndrome.

Results: No intraoperative complications were recorded with a median operative time of 112 +/- 34 minutes. In 7 cases two sessions of necrosectomy were sufficient to completely clear the necrotic tissues. Another 5 patients with extended retroperitoneal necrosis required 3 irrigation procedures. Necrosectomy using Inter pulse jet irrigation was successful in all patients, and none required complementary surgical or radiological treatment.

Conclusion: Application of Inter pulse jet irrigation for necrosectomy is a promising technique for infected necrotizing pancreatitis and should be regarded as a valid therapeutic option for necrotizing pancreatitis. Although this technique is still evolving in open abdominal surgery, it is proven to be safe and efficient and should be evaluated against existing standards of treatment.

References: 1. Losanoff JE, Richman BW, Jones JW. Temporary abdominal coverage and reclosure of the open abdomen: Frequently asked questions. *J Am Coll Surg* 2002; 195:105-115
2. Larvin M. Management of infected pancreatic necrosis. *Curr Gastroenterol Reports* 2008; 10:107–114.
3. Frossard JL, Steer ML, Pastor CM. Acute pancreatitis. *Lancet* 2008; 371:143-152.
4. Jamdar S, Siriwardena AK. Contemporary management of infected necrosis complicating severe acute pancreatitis. *Critical Care* 2006; 10:101-103.
5. Fernandez-del Castillo C, Rattner DW, Makary MA, Mostafavi A, McGrath D, Warshaw A. Debridement and closed packing for the treatment of necrotizing pancreatitis. *Ann Surg* 2000; 228: 676-684.

Disclosure: No significant relationships.

PT013 Abdominal Compartment Syndrome Following Misplacement of Central Femoral Catheter. Description of an Extremely Rare Complication

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Introduction: Description of a rare and life threatening complication following femoral vein puncture

Material and Methods: 39 years old, female patient, with severe traumatic cranio-cerebral injury and left lung confusion transferred in our hospital's I.C.U following a neurosurgical operation. Patient had mechanical airway support through endotracheal intubation (under repressive and muscle relaxant medication), ventricular catheter for intracranial pressure (IAP) monitoring, central 3way femoral catheter and nasogastric tube. On the 2nd day patient developed insipidus diabetes and electrolytic disturbances (hypernatremia). Fluids and total parenteric nutrition (T.P.N.), were administrated through the femoral catheter in order to restore the volume and correct the electrolytic disorders. Within the next hours abdominal inflation and rising of the intracranial pressure, about 45 cm H₂O, were observed. An explorative laparotomy was then performed and 7lt of fluids similar to T.P.N were drained from the abdominal cavity

Results: After surgery misplacement of the femoral catheter was diagnosed by contrast injection through the catheter (the upper end was into the peritoneal cavity while the proximal and the median in the femoral vein).

Conclusion: Femoral vein catheterization is often carried out during resuscitation and in critical care units. It is usually achieved via a blind, external landmark-guided technique, through manual localization of the femoral vein. However, this approach can be challenging in patients with severe shock because of absence or ambiguity of the arterial pulse and can lead to life threatening complications. Apparently the eversion of the J guided wire, may lead to perforation of the femoral vein and consequently to the placement of the central femoral catheter into the peritoneal cavity, with catastrophic consequences.

References: none

Disclosure: No significant relationships.

PT014 Acute Abdomen and Phytobezoars. An Extremely Rare Cause of Abdominal Compartment Syndrome

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Introduction: Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS), have been described often in patients with abdominal trauma or after emergency abdominal surgical operations. We present 3 patients with vomiting, meteorism, acute

abdomen and acute respiratory insufficiency provoked by phytobezoars. Aetiopathogenesis, symptoms and differential diagnosis are analyzed and a brief report of the literature is discussed.

Material and Methods: Three patients, were admitted to the emergency department of our hospital during the last year. All patients were presented with acute respiratory failure, abdominal pain, discomfort, meteorism and vomiting. The first patient, a 57 years old man, alcoholic was admitted with meteorism, acute abdominal pain and discomfort. A 26 Fr nasogastric tube was introduced and the symptoms were remitted after gastric evacuation. The second patient suffered from bowel obstruction after closure of colostomy as a result of traumatic injury of sigmoid colon. A laparotomy was performed and a phytobezoar was revealed at the level of anastomosis. The last patient was presented with meteorism, vomiting and dyspepsia, as a result of enlarged gastric mass, revealed after endoscopy.

Results: Gastric evacuation in the first patient revealed 5 lt of fluid mixed with a smelly gas under pressure (IAP = 33 cmH₂O after evacuation) followed by washouts. Laparotomy was performed in the second patient revealing a large phytobezoar at the level of anastomosis. Mini laparotomy and gastrotomy in the third patient (after two unsuccessful gastroscopies) revealed large phytobezoars.

Conclusion: Untreated phytobezoars can frequently have side effects. Open surgical approaches are used when they are large and symptomatic, while small phytobezoars can be dissolved by enzymatic techniques or endoscopically.

References: none

Disclosure: No significant relationships.

DISASTER & MILITARY SURGERY, TRAUMA REGISTRIES

PT015 Surgical Treatment of Wounded Men With Combined Thermomechanical Injuries (CTMI) Using Damage Control Surgery DCS

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Introduction: The objective was the substantiation of using DCS tactics in wounded with CTMI.

Material and Methods: In case of cranial injuries DCS tactics implied treating superficial wounds of skin, arrest of exterior bleeding and subsequent evacuation of the wounded within the first hours after getting trauma. In case of extremity injuries, DCS tactics implied first of all the operations on the occasion of gunshot injuries, including the arrest of bleeding, application of the external fixation apparatuses, application of temporary shunts for injured vessels. The burn wounds treating were carried out after helping the patient out of shock. In case of the wounded with chest injury in the presence of hemo- and pneumothorax, drainage of pleural cavity of silicone tubes with active air aspiration was fulfilled. In case of abdomen injuries after laparotomy abdominal cavity was cleaned and inspected including examination of the most probable sources of bleeding: liver, spleen, magistral vessels. On the background of unstable hemodynamics the

abdominal cavity tamponade along the right and left side canals, supraliver and underliver space and small pelvis.

Results: Thus, in accordance with DCS principles in case of CTMI, operations regarding gunshot injuries were made in the first turn, and operations connected with burns – in the second turn. The first were urgent operations. Then, intensive therapy in the conditions of resuscitation unit.

Conclusion: The repeated operation of the second stage – final removal of lesions – was carried out after the condition of the wounded had been stabilized.

Disclosure: No significant relationships.

PT016 Tramway and Train Disasters in the Same Year in the Region of North Moravia

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Introduction: Large-scale accidents associated with an activation of Trauma Plan happen very rarely in the Central Europe. We had to activate the Trauma Plan at the Traumatology Centre of the University Hospital Ostrava twice within one year. A crash of two tramways happened in April 2008 and an Intercity train crashed into a collapsed bridge under reconstruction in August of the same year. Most of the injured patients were treated in the Traumatology centre of the University Hospital Ostrava

Material and Methods: Ostrava tramway disaster-11/APR/2008 87 passengers, 45 injured, two patients died on the disaster scene, 23 of 45 patients were treated in Traumatology centre Ostrava, one patient died during resuscitation. 7 patients were admitted in Traumatology centre hospital, 3 patients had emergency surgery at the operating theatre. Studénka train disaster-8/AUG/2008 400 passengers, 67 injured, 7 patients died on the disaster scene, 24 from 67 patients were treated in Traumatology centre Ostrava, 15 patients were admitted in Traumatology centre hospital, 8 patients had emergency surgery at the operating theatre

Results: After activation of Trauma Plan good coordination among EMS / triage on accident scene, transport patients/, emergency units of chosen hospitals and their Traumatology centre is necessary. In our centre, we have changed the system of team cooperation in the process of care provided for the injured patients, in case of tramway accidents it was one medical team consisting of one anaesthesiologist and two traumatologists provided the whole diagnostic algorithm, with a second team receiving the patient for surgical treatment. In case of the second railway accident, one medical team took over the patient at the Emergency Hall and, following the diagnostic stage, was also responsible for the surgical treatment at the operating theatre. Thus, the need to pass on the information concerning the patients was eliminated

Conclusion: Repeated activation of the Trauma Plan brings about an improvement in organisation of care provided for the injured patients.

References: 1. Pokorný J. et al. Urgentní medicína, 1. st. edition: Praha, Galén 2004 2. Stetina et al. Medicína katastrof a hromadných neštěstí, 1. st. edition: Praha: Grada 2000 3. Facts regarding the Eschede catastrophe Oestern HJ et al. Unfallchirurgie 1998 Nov;101

Disclosure: No significant relationships.

PT017 Minimally Invasive Esophagectomy Improves Outcomes in the Surgical Intensive Care Unit

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Introduction: Esophagectomy remains one of the technically challenging operations with a recently reported perioperative mortality up to 20%. The main goal of minimally invasive esophagectomy (MIE) is to decrease the high morbidity of traditional esophagectomy especially in the surgical intensive care unit. Developing the skills for MIE is associated with a steep learning curve. We report the first case series of MIE for esophageal cancer in the Middle East.

Material and Methods: Five patients (two females) with esophageal cancer were included between January-October 2009. Standard preoperative staging lacked PET scan or upper endoscopic ultrasound. All patients underwent preoperative neoadjuvant chemotherapy followed by MIE. Perioperative morbidity and mortality in the surgical intensive care and short term outcomes were evaluated.

Results: Three patients underwent Ivor Lewis MIE in the lateral decubitus position. Two patients underwent transhiatal MIE in the prone position. Median age was 51 years. Average operative time was seven hours. Average blood loss was 200 cc. There was no perioperative mortality. There was no morbidity in the Ivor Lewis group with a median intensive care stay of three days. One patient in the transhiatal group had pneumonia and ARDS, the other patient developed left recurrent laryngeal nerve paresis. Four patients had squamous cell carcinoma and one patient had adenocarcinoma. All surgical margins were free. All lymph nodes resected were negative for malignancy. Median follow up was 5.5 months. All patients are tolerating regular diet and gaining weight. One patient developed distant metastasis.

Conclusion: Despite the learning curve, MIE is a reproducible technique. MIE is feasible following preoperative chemotherapy and radiation therapy. MIE can reduce the morbidity and mortality seen in the surgical intensive care after traditional open resection.

References:

Trends in the management of esophageal carcinoma based on provider volume: treatment practices of 618 esophageal surgeons. Enestvedt CK, Perry KA, Kim C, McConnell PW, Diggs BS, Vernon A, O'Rourke RW, Luketich JD, Hunter JG, Jobe BA. Dis Esophagus. 2009 Jun 9 Resection for esophageal cancer: strategies for optimal management. Pennathur A, Luketich JD. Ann Thorac Surg. 2008 Feb;85(2):S751-6. Review

Disclosure: No significant relationships.

PT018 Perforation of Oesophagojejunal Anastomosis by Oesophagojejunal Tube

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Introduction: The AA highlight the importance of the damage control philosophy in difficult emergency surgery situations like the perforation of an oesophagojejunal anastomosis by an oesophagojejunal tube.

Material and Methods: Man, age 78, 3rd pod after total gastrectomy with precolic reconstruction for gastric cancer (T2N2MxR0) in another institution. No significant past diseases. Mechanically ventilated, in septic shock, with purulent drainage from right hemithorax and blue drainage from right abdominal upper quadrant, after "methylene blue" swallow. Distended abdomen. Relaparotomy with median frenotomy (Pinotti) and damage control procedures for oesophagojejunal and cardiophrenic pleural sinus perforation by an esophagojejunal tube, with right pleural empyema, mediastinitis and peritonitis: primary closure of the perforation, washing and drainage of the pleura, mediastinum and peritoneum, delayed abdominal closure (DAC, Rotondo and Schwab) and intensive care unit (ICU). On 5th pod, revision of the mediastinum and peritoneum, no evidence of fistula: internal pleural drain retired, fibrin glue and collagen placed to protect the anastomosis, DAC and ICU. On 8th pod, anastomotic leak: a T-tube (Kehr) has been placed as a minimal drainage procedure; DAC and ICU. On 10th pod, descendent feeding jejunostomy and abdominal closure. On 14th pod, subfrenic abscess on CT scan: surgical drainage through the upper third of the previous closed laparotomy. On 32nd pod, intestinal subocclusion: drainage jejunostomy above the feeding one. On 41st pod, right pleural drainage: oesophagoscopy, T-tube removed and expansible silicon covered oesophageal prosthesis inserted, covering the anastomotic fistula. On 62nd pod, patient left the ICU.

Results: On 77th pod, patient sent back to the institution where he has been operated first. On 99th pod, endoscopic removal of the prosthesis with baritaded swallow control, with patient sent back home.

Conclusion: This case highlights the importance of the damage control philosophy in difficult emergency surgery situations like the perforation of an oesophagojejunal anastomosis by an oesophagojejunal tube.

Disclosure: No significant relationships.

PT019 Superior Mesenteric Artery Syndrome Causing Massive Gastric Dilatation in a Young Healthy Female

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Introduction: Acute gastric dilatation due to superior mesenteric artery syndrome in healthy subjects is extremely rare. Herein we

report its sonographic findings and highlight the value of point of care bedside ultrasound in such a case.

Material and Methods: A 17-year old female was admitted to Al-Ain Hospital complaining of epigastric pain of two days duration following excessive eating. She was nauseated but could not vomit. Succussion splash was positive. Bedside ultrasound has shown a hyperactive duodenum, a distended stomach compressing on the IVC, and a narrowed angle between the superior mesenteric artery and the aorta. These findings were confirmed by abdominal CT scan. The angle between the aorta and superior mesenteric artery was only 8°-10°. Gastrographin follow through has shown complete obstruction of the third part of the duodenum. Nasogastric tube immediately drained 3500 ml of yellowish fluid.

Results: Five days later gastrographin follow through has shown free passage of the dye to the small intestine with significant reduction in the stomach size. The patient was discharged home in a good condition.

Conclusion: Bedside ultrasound has proven extremely useful for both the diagnosis and management of this rare case.

Disclosure: No significant relationships.

PT020 A Rare and Potentially Lethal Complication During Right Hemicolectomy

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Introduction: A rare and potentially lethal complication during right hemicolectomy

Material and Methods: A 75 year-old male, underwent a right hemicolectomy due to malignancy in the cecal region. During the operation the relatively constant venous anastomosis between the middle colic vein and the inferior pancreaticoduodenal vein close to the lower border of the pancreas was injured, resulting in excessive haemorrhage. In the effort to manage the bleeding, the superior mesenteric vein (SMV) was torn, and after multiple unsuccessful efforts to repair the vein, we finally had to ligate the SMV. The operation was completed by typical right hemicolectomy and the abdomen was closed. Five hours later the patient showed acute distention of the abdomen together with respiratory distress. Due to increased abdominal pressure (> 35 cm H₂O), the patient was taken back to the OR. The small bowel was edematous, bluish but viable. The abdomen left open and was closed by using the VAC. The patient was taken to the ICU. Six days later the small bowel returned to normal colour and thickness, but the generalized edema made the closure of the abdomen impossible. By day ten the patient was on full enteral feeding, and was taken to the OR, where free partial thickness skin grafts were used to close the abdomen.

Results: The patient was extubated by day sixteen and was taken to the rehabilitation center.

Conclusion: Accidental injury of the venous anastomosis between the middle colic vein and the inferior pancreaticoduodenal vein close to the lower border of the pancreas, may prove a potentially life threatening condition. We present this case in order to point out this rare complication of right hemicolectomy.

References: 1. Manenti A. Dissection of the superior mesenteric vessels. Advantages in surgery. *Nouv Presse Med.* 1982 Feb 13;11(7):521-2. 2. Yamaguchi S, Kuroyanagi H, Milsom JW, Sim R, Shimada H. Venous anatomy of the right colon: precise structure of the major veins and gastrocolic trunk in 58 cadavers. *Dis Colon Rectum.* 2002 Oct;45(10):1337-40.

Disclosure: No significant relationships.

PT021 Validation of Fournier's Gangrene Severity Index score (FGSIS)

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Introduction: Fournier's gangrene (FG) is a severe necrotizing fascitis of the genital and perineal area, with a variable mortality of up to 50% in some series. A FGSIS was reported by Laor et al. in 1995 to gauge the severity and prognosis of the condition. Our aim is to assess the value of this score in predicting severity and survival in our patients.

Material and Methods: Retrospective, descriptive study of patients diagnosed with FG at our hospital between 1998 and 2008. We have assessed demographic characteristics, vital signs and blood tests on admission, time to recovery and final outcome. FGSIS was devised as a modification of the APACHE-II score, and includes 9 parameters (temperature, heart rate, respiratory rate, sodium, potassium, creatinine, hematocrit, WBC count, and bicarbonate). Each parameter is given a score of between 0 and 4. Results were assessed by means of SPSS for Windows (version 15.0).

Results: The series includes 34 patients, with a male/female ratio of 30/4, and a median age of 69 years. There were 9 deaths (26%). When comparing FGSIS parameters between dead and survivors, only differences in serum potassium were statistically significant. The median FGSIS on admission for the dead and survivors was of 8 and 4, respectively, being statistically significant. The probability of death was of 75% for a FGSIS > 9.

Conclusion: In our series FGSIS has proved to be a simple and effective method to gauge the severity and predict survival in patients with Fournier's gangrene.

Disclosure: No significant relationships.

PT022 Unplanned Surgical Readmissions Within 30 Days – An Analysis

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Introduction: It is not unusual that patients are readmitted after surgical care but the knowledge of its cause and frequency is

incomplete. The aim of this study was to analyze unplanned surgical readmissions in our clinic during one year.

Material and Methods: All surgical patients at the Dept. of Surgery, University Hospital in Linköping were documented prospectively in a quality control database. All unplanned readmissions (u.r) within 30 days after surgery during 2007 were audited by scrutinizing the medical records.

Results: During the time period, 2997 patients received in-patient care. 357 patients were readmitted within 30 days of which 187 patients constituted u.r. 98 patients had undergone major surgery initially and 89 had other surgical care initially. There were no differences in u.r. after surgery in acute (56/979) or elective settings (42/736). After acute cholecystectomy 10.5% were readmitted and after colonic surgery 17.3%. In patients operated for perforated appendicitis 17.3% were readmitted. Abdominal pain was the most frequent cause for u.r. in patients not being operated initially. Forty-four % of patients who were not operated during their initial hospital stay were operated during the u.r. In patients who underwent surgery during the primary admission, 19% were u.r. due to intra-abdominal abscesses, most of them (68%) after primary contaminated operations. More than 60 different diagnosis and more than 40 different procedures were conducted on patients with u.r.

Conclusion: Of all patients who underwent surgery at our department 5.7 % were readmitted unplanned. There were no differences among elective or acute patients. Readmissions due to intra abdominal abscesses were most frequent after a contaminated operation and should therefore not be noted as an iatrogenic infection in the quality registration. The most common diagnosis for u.r. after surgery was perforated appendicitis.

References: Frankl SE, Breeling JL, Goldman L. Preventability of emergent hospital readmission. *Am J Med* 1991; 90: 667-74. Dobrzanska L, Newell R. Readmissions: a primary care examination of reasons for readmissions of older people and possible readmission risk factors. *J Clin Nurs* 2006; 15: 599-606. Billings J, Dixon J, Mijanovich T, Wennberg D. Case finding for patients at risk of readmission to hospital: development of algorithm to identify high risk patients. *BMJ* 2006; 333: 327-30.

Disclosure: No significant relationships.

PT023 Long Term (>6 YEARS) Quality of Life After Surgical Intensive Care Admission

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Introduction: Treatment of surgical patients in the ICU, affected by severe illnesses or injuries, should be justified by an acceptable survival and long term quality of life (QoL). The primary aim of this study was to quantify the long term QoL (> 6 years) of a large cohort of patients admitted to a surgical intensive care unit. In addition, we

aimed to explore the influence of different surgical diagnosis groups on long term health status and to make comparisons with general population norms.

Material and Methods: QoL was measured in all surviving surgical ICU patients admitted to a Dutch teaching hospital between 1995 and 2000. Patient-reported data on QoL were collected with the EuroQoL-5D + after a mean follow up of 8 (range 6-11) years. Patient characteristics, surgical diagnosis group, length of ICU stay and survival were prospectively registered. EQ-utility scores (EQ-us), EQ Visual Analogue Scales (VAS) and prevalences of domain-specific health problems were calculated. The effect of surgical diagnosis group on EQ-us/EQ-VAS was assessed by multivariable generalized linear regression analysis. Logistic regression was used to explore the influence of surgical diagnosis group on domain specific health problems. Long term quality of life of surgical ICU patients was compared to an age- and sex-matched general Dutch population using the T-test analysis.

Results: 834 patients survived the ICU and were available for follow up. In 598 (72%) patients the health-related QoL was measured. For all surgical groups combined, after 6-11 years nearly half of all patients still suffered from problems in the dimensions mobility (52%), usual activity (52%), pain (57%) and cognition (43%). Compared to the age- and sex matched general Dutch population HRQoL was worse with a difference of 0.11 on the EQ utilities score (range 0-1). Oncological surgery patient had the best (EQ-us 0.83) and vascular patients had the worst (EQ-us 0.72) HRQoL. Trauma (odds ratio between 2.47-3.47) and vascular surgery (2.27-5.37) showed significantly increased prevalences of problems in mobility, self-care, usual activities and cognition.

Conclusion: More than 6 years after a surgical ICU admission, quality of life of this patient population is largely reduced. Many patients still suffer from a variety of health problems, including decreased cognitive functioning. Treatment advances should be made to reduce the current health deficit of surgical ICU survivors compared to the general population.

Disclosure: No significant relationships.

PT024 Prognostic Factors in Severe Acute Pancreatitis

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Introduction: Predicting the prognosis in severe acute pancreatitis is crucial in order to constitute effective treatment strategies.

Material and Methods: Thirteen consecutive patients admitted with the diagnosis of severe acute pancreatitis according to Glasgow or Ranson criteria were evaluated. We searched the prognostic values of age, gender, etiology of pancreatitis, comorbidity and laboratory values and their effects on complications and length of hospital stay.

Results: Mean age was 57,6 years (range: 27-83 yrs). Etiology was biliary in 9 patients (2 after ERCP). Acute cholecystitis was also present in 7 patients. 4 patients had diabetes mellitus. Two patients had percutaneous cholecystostomy. Five patients had ERCP at a mean of 2,5 days after admission. Cholecystectomy was performed in 8 patients, either at the first admission (n:4) or after 6-8 weeks. Mean

WBC, ALT, AST, and LDH values on admission and mean highest hsCRP levels and mean lowest serum calcium (Ca) levels in the first 48 hours were 14750/mm³, 205 U/L, 190 U/L, 438 U/L, and 106 mg/L and 8 mg/dl, respectively. Pancreatic necrosis (30,8%) was diagnosed by computerised tomography in 4 patients (2/4 in diabetics, 2/9 in non-diabetics); a total of 5 patients (38%) had systemic complications. Mean LDH (594 U/L vs 360 U/L) and lipase levels (4503 U/L vs 2952 U/L) were higher in patients who developed necrosis, though not statistically significant. Other parameters were similar in patients with or without necrosis. Two patients who had pancreatitis due to ERCP underwent pancreatic necrosectomy. Median hospital stay was 9 days (range: 3-75 days). All patients survived. Mean highest hsCRP and lowest Ca levels in the first 48 hours correlated significantly with the hospital stay (r: 0.65 p: 0.041 for hsCRP, and r: -0.689 p: 0.04 for Ca).

Conclusion: Although we have a limited number of patients, we may conclude that high levels of LDH, lipase, hsCRP and low levels of Ca can be used as predictive factors for severe pancreatitis. Pancreatitis seen after ERCP and in diabetic patients tend to be more severe.

References: 1.Ueda T, Takeyama Y, Yasuda T, Matsumura N, Sawa H, Nakajima T, Ajiki T, Fujino Y, Suzuki Y, Kuroda Y. Simple scoring system for the prediction of the prognosis of severe acute pancreatitis. *Surgery*. 2007 Jan;141(1):51-8. 2.Kong L, Santiago N, Han TQ, Zhang SD. Clinical characteristics and prognostic factors of severe acute pancreatitis. *World J Gastroenterol*. 2004 Nov 15;10(22):3336-8.

Disclosure: No significant relationships.

PT025 Spontaneous Rupture of Giant Cavernous Hemangioma of the Liver in a Patient With Systemic Hemangiomatosis and Kasabach-Meritt Syndrome. An Interactive and Multidiscipline Case

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Introduction: Hemangiomas are frequent benign tumors of the liver. Symptoms (abdominal pain and fullness) are mostly seen in giant lesions. Rupture is the most severe complication, can occur spontaneously, with intraperitoneal bleeding, with a high mortality. This complication is the principal indication for surgery.

Material and Methods: We report a case of spontaneous rupture of a giant cavernous hemangioma of the liver in a 42-year-old woman that attends to local emergency with abdominal pain and hypovolemic shock without history of trauma. Emergency laparotomy reveals giant cavernous hemangioma that is bleeding in to the abdominal cavity. Damage control surgery is done with liver packing and drainage of the

abdomen. Abdominal imaging reveals persistent bleeding and multiple bone lesions compatible with bone hemangioma with low blood platelets count – Kasabach-Meritt syndrome. Patient is transferred to a central hospital for arterial embolization of the right hepatic artery that is not effective. The authors describe surgical control of the bleeding without liver resection. Second look surgery was undertaken with removal of hepatic packing and Pringle's manoeuvre with temporary control of the haemorrhage with haemostasis and ligation of the right hepatic artery. It was needed several surgery's more with additional packing, haemostatic mesh and haemostatic products in order to control the bleeding. The patient was proposed for liver transplant during the process but was not accepted.

Results: Patient survived with normal liver function and without further bleeding, not needing liver resection.

Conclusion: Spontaneous rupture of giant cavernous hemangioma is a very difficult to control and life-threatening situation, but it is possible to overcome this situation with damage control measures and adequate life support

Disclosure: No significant relationships.

VISCERAL TRAUMA

PT026 Nonoperative Management of IV Grade Splenic Injury – Case Report

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Introduction: Management of splenic injury has evolved over the past 25 years. Nonoperative management has gained currency, first in children and after in adults.

Material and Methods: We present a case of a 60 years-old man who fell for 2 m, haemodynamically stable, presenting pain on the left part of thorax and upper abdomen.

Results: The patient fall for 2 m 4 hours before the arrive in our ER; he was haemodynamically stable (BP=130/70 mmHg, AV=95 bpm) and presented pain on the left thorax and left hypocondrium. Laboratory showed 12,3 g/dl haemoglobin. Radiologic test: laterally 10th left rib fracture. Ct scan revealed IV grade spleen injury and perisplenic hemoperitoneum. We choosed non-operative management – after 7 days Ct scan showed reduced dimensions of dilacerated spleen injury and no hemoperitoneum. The patient status was stable during the 10 days hospitalisation. Imagistic control after 1 month: homogenous spleen structure.

Conclusion: The haemodynamic status of the patient is the most reliable criteria for non-operative management, not Ct aspect of the injury.

References: 1. EAST – Practice management guidelines for the nonoperative management of blunt injury to the liver and spleen 2. Moore F. – Nonoperative management of blunt splenic and liver injury (2007); 3. Kohn J., Clark D. – Is CT grading of splenic injury useful in the nonsurgical management of blunt trauma? (1994); 4. Schurr MJ, Fabian TC – Management of blunt splenic trauma: CT contrast blush predicts failure of nonoperative management (1995);

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PT027 Failure of Nonoperative Management of Splenic Injuries

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Introduction: During the past 2 decades, management of blunt splenic injuries has changed dramatically. Successful nonoperative management (NOM), the refinement of computed tomographic (CT) scanning and more aggressive use of interventional radiology have all contributed to this change.

Material and Methods: The aim of the study is to determine the incidence and type of delayed complications from NOM to the patients admitted in our hospital with blunt splenic injuries between January 2004 and December 2008. Of 132 patients, 58 (44%) were treated nonoperatively. The splenic injury was graded by the Organ Injury Scale of the AAST. Of the initially medical records, 16 patients who died within 48 hours were excluded. The severity of injury was measured by the Injury Severity Score (ISS). The outcomes for categorical variables were tested using χ^2 test and a significance level at $P < 0.05$ was maintained. Delayed complications were defined as any complication directly attributable to the splenic injury that occurred more than 48 hours after injury. The following data was retained: age, sex, mechanism of injury, ISS, number of ICU days, overall length of stay, number of blood units transfused, day of operation and discharge status.

Results: Our study found 10,4% incidence of delayed complications after NOM. These complications include delayed hemorrhage (4 cases), splenic artery pseudoaneurysm (1) and splenic abscess (1 case). The need for operation due to ongoing bleeding was retained in following situations: more than 4 U of blood to maintain a Hb higher than 10 g/dL, systolic pressure to less than 90 mm Hg despite resuscitation and evidence of peritoneal signs. Of the 6 patients failing NOM, 67% failed between days 3 and 5 and 83% in the first week. In all cases a splenectomy is performed with no mortality rate.

Conclusion: The results of this study indicate 2 independent risk factors of failure of NOM: a high CT grade of splenic injury (grade III and above) and a transfusion with more than 3 U of blood. Significant number of delayed splenic complications is potentially life-threatening.

References: 1. Ochsner MG. Factors of failure for nonoperative management of splenic injuries. *World J Surg.* 2001; 25: 1393-6 2. Bee TK. Failure of splenic nonoperative management. *J Trauma* 2001; 50: 230-236 3. Wisner D. Injury to the spleen. In: *Trauma*. Moore FM. McGraw-Hill; 2004: 663-686 4. Miller PR. Associated injuries in blunt solid organ trauma: implications for missed injury in nonoperative management. *J Trauma* 2002; 53: 238-244 5. Cogbill TH. Nonoperative management of blunt splenic trauma. *J Trauma.* 1989; 29: 1312-1317

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PT028 Splenic Injuries in Polytrauma Patients

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Introduction: Aim. To establish the diagnostics and management tactics in polytrauma patients with splenic injuries upon the hemodynamic stability and organ injury severity.

Material and Methods: We analyzed 296(33.07%) cases of splenic injuries in 895 polytrauma pts. There were – 276(93.2%) ($p < 0.001$) blunt trauma, patients injured in car accidents 108(36.5%) and direct trauma 100(33.8%) ($p < 0.001$). In 214(72.3%) the patients had associated thoracic trauma, 193(65.2%) – head trauma, 96(32.4%) – limbs injuries, and 74(25%) – severe shock. In $\frac{3}{4}$ cases the splenic injury was initially manifested – 223(75.3%), and in 73(24.7%) cases the clinical signs developed later ($p < 0.001$). Depending on the patient's hemodynamic stability and trauma mechanism US, DPL, CT or laparoscopy were used. 274(92.6%) patients were operated and in 22(7.4%) cases non-operative management were used. Injuries of I-II degree were managed non-operatively or organ-preserving procedures were used ($p < 0.05$). Splenectomy was used only in severe injuries ($p < 0.001$).

Results: Postoperative complications occurred in 96(32.4%) patients, postoperative lethality was 21.96%.

Conclusion: Splenic injuries must be always suspected in all cases of inferior thoracic and superior abdominal wounds and in cases of left-sided inferior rib fractures, inclusively in patients with catatrauma and car crash. Diagnostic difficulties are induced by multiple organ injury and associated trauma. The diagnostic algorithm depends on the patient's hemodynamics. In cases of I-II degree injury the procedures of choice are the non-operative or organ-preserving techniques. In severe splenic injuries splenectomy is a safe surgical procedure. The outcome depends on shock on admission and splenic injury severity.

Disclosure: No significant relationships.

PT029 A Life-Saving Procedure for an Uncommon Cause of Hemoperitoneum: Perisplenitis Cartilaginea with Rupture of Spleen and Liver Managed with Splenectomy and Haemostatic Roll Spring Suture of the Liver

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Introduction: Hemoperitoneum in the context of cirrhosis and portal hypertension is a catastrophic complication that exposes emergency surgical teams to complex decisions. Hypotension, acidosis and hypovolemia demand blood and plasma transfusions simultaneous to a quick surgical technique. We present a case of spontaneous rupture of liver and spleen in a patient with portal hypertension and a capsular fibrosis that joined both organs, an unusual condition called perisplenitis cartilaginea. We describe our unusual technique in this unusual case, according to our research in medical literature over PubMed.

Material and Methods: On 24/10/2008 we attended a male patient 76 years old with spontaneous abdominal pain, left upper quadrant tenderness and hypotension. He suffered previously diabetes mellitus type II and cirrhosis of uncertain origin. The hemodynamically unstable patient was pale, with 60 mm Hg systolic arterial tension, 10 g of hemoglobin, 31% hematocrit, coagulopathy, and acidosis. He undergo abdominal CT scan with intravenous contrast enhancement and an active bleeding from left hepatic origin (segment IV) and left gastric margin was diagnosed, suspecting liver tumor. A prompt celiotomy was required, initiating blood, platelet and plasma or cryoprecipitate transfusions. A massive hemoperitoneum, a ruptured splenic hilum and an injured left hepatic border, both in close continuity by a fibrous neocapsula was demonstrated. Package of the liver was done while splenectomy was accomplished. After detaching hepatic ligaments until diaphragmatic plane, we sutured a left hepatic lobe, larger and thinner than usual, without success because of failed haemostasis in spite of 12 concentrates and platelets and fresh plasma infused. In an attempt to win time the lesion was covered with Tachosil and liver rolled over it as a "spring roll", knotting the roll with silk suture. Half an hour after transfusions haemostasis was possible and intervention finished.

Results: Patient recovered in ICU without complications and was discharged on 20/11/2008 with normal oncological markers, transaminases and hepatitis B or C virus serology. Exam of the spleen revealed a ruptured hilum and a total capsular fibrosis, probably from erosive contact with diaphragm. Two months later TC showed benign changes in liver anatomy with hypervascularized areas, a 4 cm hematoma in segment IV and an accessory spleen of 22.5 mm near pancreatic tail.

Conclusion: When hypovolemia, acidosis and coagulopathy associate with hemoperitoneum, liver and spleen injury, damage control allows time for recovering in ICU and posterior definitive surgery. Our "roll spring" suture technique avoided surgery in two stages and did the surgical procedure the definitive one.

Disclosure: No significant relationships.

PT030 Contrast Enhanced US Assessment After Partial Splenectomy for Trauma

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Introduction: Notwithstanding NOM is the most frequent treatment for splenic injuries, partial splenectomy could be selectively performed in stabilized patients (pts) with splenic lesions not suitable for NOM and/or angioembolization. Assessment of viability of residual parenchyma is crucial to make sure immunologic function is preserved. Standard imaging (radionuclide scan) implies radiation exposure and cannot be performed in the immediate postoperative (po) period. Aim of the study was to evaluate the accuracy of CEUS in assessing perfusion of the residual spleen in the early postoperative period.

Material and Methods: Surgeon-performed CEUS with second generation contrast media (Sonovue® - Bracco, Italy) was scheduled on po day 1, 5, 10 and 30 after partial splenectomy in 2 male pts (22 and

27 years old) submitted to upper partial splenectomy for blunt trauma. Residual spleen after surgery was 1/3 and 2/5 respectively. CEUS was preceded by standard B-mode US with color flow mapping in all cases; videoclips of each exam were stored for forensic medicine issue too. Mean time for CEUS exam was 5-7 minutes.

Results: CEUS allowed to recognize regular perfusion of the residual spleen in both patients. Conspicuity of CEUS imaging was high and impressive. Homogeneous complete distribution of the contrast medium in the parenchyma was observed on day 5 in both pts. CEUS follow-up on day 10 and 30 did not add any supplementary information. Pts were discharged on day 7 and day 11 respectively, without indications for vaccinations or antibiotic prophylaxis.

Conclusion: CEUS is an effective method for assessing perfusion of the residual spleen after partial splenectomy. CEUS can be performed bedside by the surgeon in the early po period or on an out-patient basis. Imaging interpretation is immediate and distribution of the contrast medium assure about viability of the splenic tissue. CEUS imaging allowed us to omit prophylactic vaccinations. It is the first description of the use of CEUS in this particular setting.

Disclosure: No significant relationships.

PT031 Accuracy of Surgeon Performed Sonography in Blunt Abdominal Trauma

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Introduction: Focused assessment with sonography for trauma (FAST) is used as a screening tool to detect hemoperitoneum in patients with blunt abdominal injuries in many trauma centers all over the world, but is not routine in Iran. This study designed to evaluate the accuracy of FAST performed by surgeons in our center and announce its advantages to Iranian surgeons.

Material and Methods: One hundred blunt abdominal trauma patients admitted in Baqiyatallah Hospital since April 2008 to April 2009 were evaluated. FAST performed by trained general surgeons to detect intraperitoneal fluid. Data were analyzed using the chi-square test.

Results: Of 100 patients, there were 15 female (15%) and 85 male (85%) with the mean age of 29 years. 5 patients had proven intra-abdominal injuries and 95 had no injuries. FAST was positive in 7 patients and negative in 93 patients. There were 2 false positive FAST. The sensitivity and specificity of FAST were 100 per cent and 97.8 per cent, respectively. The positive predictive value was 71.4 per cent, the negative predictive value 100 per cent and the accuracy 98 per cent.

Conclusion: Surgeon performed sonography in blunt abdominal trauma is a rapid and accurate test to detect intraperitoneal blood. FAST should be available in all trauma centers and all trauma surgeons should be familiar with it.

References: 1- Hoyt DB, Coimbra R, Acosta J: Management of Acute Trauma in: Townsend: Sabiston Textbook of Surgery, 18th ed 2008; ch2 2-. Dente CJ, Rozycki GS: Surgeon-Performed Ultrasound in Trauma and Surgical Critical Care in: Feliciano, David V.; Mattox, Kenneth L.; Moore, Ernest E. Trauma, 6th Edition 2008 ps:321-338 3-Shackford SR, Rogers FB, Osler TM, et al.: Focused abdominal sonogram for trauma: The learning curve of nonradiologist clinicians in detecting hemoperitoneum. J Trauma 1999;46(4):553-564 4-Huff WS, Holevar M, Nagy KK, et al.: Practice Management Guidelines for the Evaluation of Blunt Abdominal Trauma: The EAST Practice

Management Guidelines Work Group. J Trauma 2002;53:602 5-Rozycki GS, Ochsner MG, Feliciano DV, et al.: Early detection of hemoperitoneum by ultrasound examination of the right upper quadrant: A multicenter study. J Trauma 1998; 45:878 6-Soundappan SV; Holland AJ; Cass DT; Lam A: Diagnostic accuracy of surgeon-performed focused abdominal sonography (FAST) in blunt paediatric trauma. Injury 2005 Aug;36(8):970-50. 7- Rozycki GS, Ballard RB, Feliciano DV, et al.: Surgeon-performed ultrasound for the assessment of truncal injuries: Lessons learned from 1,540 patients. Ann Surg 1998;228:557. 8- Rozycki GS, Knudson MM, Shackford SR, et al.: Surgeon-Performed Bedside Organ Assessment with Sonography after Trauma (BOAST): A pilot study from the WTA Multicenter Group. J Trauma 2005; 59:1356. 9- Freitas ML, Frangos SG, Frankel HL: The status of ultrasonography training and use in general surgery residency programs. J Am Coll Surg 2006;202:453.

Disclosure: No significant relationships.

PT032 Role of Magnetic Resonance Cholangiopancreatography (MRCP) in the Diagnosis of Pancreatic Trauma and Influence Upon Treatment Options

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Introduction: Pancreatic injury is a rare entity and is associated with increased morbidity and mortality. The aim of our study is to evaluate the utility of magnetic resonance cholangiopancreatography (MRCP) in the diagnosis of pancreatic injuries and the pancreatic-specific complications and its impact upon treatment options.

Material and Methods: In this study 12 patients with suspected pancreatic injury were included. All the patients were hemodynamically stable. The MRCP findings were correlated with results of computed tomography, endoscopic retrograde cholangiopancreatograms, operative findings and with clinical and laboratory data.

Results: All the patients suffered from blunt abdominal trauma. Pancreatic duct injuries were detected in 5 patients. In 2 patients the computed tomography failed to reveal pancreatic duct injury. The computed tomography findings in 4 cases pancreatic laceration and in 4 only peripancreatic fluid without any other direct sign. Data obtained by the MRCPs were used to guide treatment options in all patients. Disruption of the pancreatic duct is treated surgically in 2 patients and by therapeutic endoscopy with stent placement in the rest 3 patients.

Conclusion: MRCP as a noninvasive diagnostic modality plays a crucial role in detection of pancreatic duct trauma and pancreas-specific complications and provides adequate information which influence the treatment decision making.

Disclosure: No significant relationships.

PT033 Portal Vein and Hepatic Arterial Trauma Injuries – A Case Report

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Introduction: Injuries to the abdominal visceral vessels are uncommon but devastating entities that incur extremely high rates of mortality. The rarity of these injuries prevents many trauma centers and trauma surgeons from developing a significant knowledge learning curve. The authors describe a case with abdominal visceral vascular abdominal blunt trauma, presented with laceration in the confluence of inferior mesenteric vein and splenic vein, laceration of the hepatic artery associated with hepatic hematoma, periduodenal and peripancreatic hematoma. The routine principles of vascular surgery were applied to the management of these visceral blood vessels injuries: adequate exposure, proximal and distal control, débridement of the vessel wall, meticulous arteriography and venography with fine monofilament vascular sutures and early institution of damage control resulting in a successful repair.

Material and Methods: The authors made a review of several large series in the literature which are also consistent with a low incidence of visceral vessel injuries. Vascular trauma is complex and ideally is carried out by experts in a multidisciplinary environment. A broad spectrum of surgical specialties are involved in the resuscitative phase of trauma care including general, trauma, thoracic and vascular surgery.

Despite a relatively low incidence of vascular trauma in Portugal, the results are satisfactory because of active and early management by surgeons on call, whether with vascular training or not, treating all kinds of vascular surgical emergencies. A trauma and emergency surgical speciality is a challenge.

Results: Little information describing the first repair or ligation of any visceral vessel injuries can be found in the literature. Visceral vascular injuries carry a significant mortality rate. Vascular injury poses a small but significant challenge in Portugal trauma care. Opportunities such as better practice guidelines and minimum standards will allow surgeons to improve delivery of quality care to the next generation of vascular trauma victims. Training in the management of vascular trauma surgery with integration of vascular and general surgery in trauma care should optimize outcomes.

Conclusion: From reviews of large series dealing with the management of abdominal vascular injuries, the incidence can be estimated to be between 0.01% to 0.1 % of all vascular injuries. Few data are available describing the mortality rate for patients with portal vein injuries. The author's vision is that all vascular and general surgery trainees would eventually undertake the Definitive Surgical Trauma Care Course and improve outcomes and reduce mortality.

References: Sugrue M: Quality trauma care: The future? Aust NZ J Surg 68: 819, 1998. Tyburski JG: Factors affecting mortality rates in patients with abdominal vascular injuries. J. Trauma 50:1020-1026, 2001

Disclosure: No significant relationships.

PT034 Management of Full-Thickness Duodenal Laceration in the Damage Control Era: Evolution to Primary Repair Without Diversion or Decompression

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Introduction: The operative management of full-thickness duodenal lacerations (DL) is challenging and controversial. Several techniques have been advocated to prevent dehiscence, fistulization, and intra-abdominal sepsis. These include diverticulization, triple tube ostomy, tube duodenostomy, and pyloric exclusion. Recently, surgeons have questioned whether prophylactic decompression/diversion (DD) is necessary and have noted complications associated with the techniques themselves.¹⁻⁴ Alternatives to routine DD are damage control (DC) and planned reoperation (PR) strategies. Instead of performing a primary repair and enteral DD in a single operation, surgeons repair the DL and employ a "touch-up" strategy without DD in 1 or more re-explorations. At our trauma center, the advent of DC/PR strategies has resulted in an evolution in our management of full-thickness DL: less DD and increased reliance on re-explorations. We review our 20 year experience to determine the influence of this practice change on the outcome of DL.

Material and Methods: Retrospective review of all patients with full-thickness DL surviving more than 72 hours at our level 1 trauma center in the years 1989 - 2009. Patients requiring pancreaticoduodenectomy (n = 2) were excluded.

Results: 41 patients had full-thickness DL (22 penetrating and 19 blunt, mean abdominal trauma index (ATI) of 45 ± 24). 21 patients were treated in the 1st decade (1989 - 1998) and 20 in the 2nd decade (1999-2009). The use of DC/PR increased from 52% in the 1st decade to 70% in the 2nd. The use of DD decreased from 52% to 35%. There were 5 duodenal-related complications (DRC) in 4 patients in the 1st decade and none in the 2nd. 25 patients with a mean ATI of 56 ± 22 had DC/PR. Within the DC/PR group 13 patients (52%) had DL repair without DD and none had a DRC. The 2 DRC in the DC/PR group were both related to DD; 1 duodenostomy leak and 1 gastrojejunostomy obstruction. 16 patients (ATI 28 ± 17) had DL repair with or without DD followed by abdominal fascial closure. 2 of these 15 patients developed 3 DRC - 2 duodenal obstructions (1 partial, 1 complete) and 1 periduodenal abscess. Both of these patients were initially managed without DD. There were 2 in-hospital deaths not related to the duodenal repair.

Conclusion: Over the past 2 decades, we have increased our use of DC/PR strategies for patients with full-thickness DL, decreased our use of DD, and have reduced our risk of duodenal complications. When DC/PR is used, prophylactic DD may be unnecessary and meddlesome. DD is recommended, however, when the duodenum is obstructed or nearly obstructed following primary repair.

References: 1. ANZ J Surg 2005;75:581. 2. World J Surg 2006;30:488. 3. J Trauma 2007;62:829. 4. World J Surg 2008;32:7.

Disclosure: No significant relationships.

PT035 Incidence of Abdominal Compartment Syndrome in Patients with Multiple Injuries. A Single Institution Experience

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Introduction: High rates of intra-abdominal pressure, has been proved to increased mortality, especially in multi-trauma patients followed laparotomy. Multiple organ failure syndrome (MOFS), derived by intra-abdominal hypertension, has been called abdominal compartment syndrome (ACS), the epidemiology and the characteristics of which, have not been thoroughly determined. High degree of suspicion, continuous patient monitoring and bladder pressure measuring are the most helpful tools in making early diagnosis

Material and Methods: From 2003 to 2008 in 23 multi injured patients (Median age 43,7 years, M/F 15/8) was posed the diagnosis of intra-abdominal hypertension (Median pressure = 30 cm H₂O with range 27-42 cm H₂O). Bladder pressure measurements were obtained at 3 h intervals. In 12 (45,7%) of them (Group A, median age: 47,8 years), ACS was confirmed (Median pressure 33 cm H₂O; Range: 30-42 cm H₂O), while in 13 injured patients (54,3%) (Group B, median age: 38,8 years), only intra-abdominal hypertension was detected (Median pressure 28 cm H₂O; Range: 25-30 cm H₂O).

Results: In all patients, abdominal decompression was performed surgically because of intra-abdominal injuries such as hemoperitoneum, acute necrotizing pancreatitis, acute mesenteric ischemia and others. In Group A, 4 (29%) patients died. In the Group B, 2 patients (17%) died. A vs B $p < 0,0001$ (95% CI: 0,0001-0,001) χ^2 test.

Conclusion: As we noticed, Abdominal Compartment Syndrome is occurred more frequently than we expected in multi-injured patients. Mortality is still high, even with continuous patient monitoring, and prompt abdominal decompression. In our opinion, further studies regarding physiopathological mechanisms are essential in establishing the optimal therapeutic approach.

Disclosure: No significant relationships.

PT036 Incarcerated Postraumatic Intercoastal Lung Hernia. Case Report and Review of the Literature

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Introduction: Intercoastal pulmonary hernias are rare and mostly resulting from complications related to the chest trauma. The authors report a case of traumatic intercoastal pulmonary hernia in a 35-year-old man. He was admitted to the hospital as a traumatic patient after a motor-cycle accident.

Material and Methods: Beside multiple polytraumatic injuries the patient had a blunt injury to the left chest. Physical examination revealed a bulge on palpation of the left chest wall. Computed tomography (CT) scan of the chest revealed the protrusion of lung tissue outside the intercoastal space. Size of hernia, incarceration and respiratory insufficiency mandate immediate surgical intervention. Post-operative course was uneventful, and there has been no sign of recurrence of hernia.

Results: Post-traumatic lung herniation through a defect in chest wall is an uncommon injury. Various methods of treatment and repair have been described, including both purely thoracoscopic to full open techniques. The authors repaired a case using a minithoracotomy.

Conclusion: Lung hernia is an uncommon entity defined as the protrusion of pulmonary tissue and pleural membranes through defects

of the thoracic wall. Chest trauma is the most common cause. Timely surgical intervention is critical to favorable patient outcomes. Effective management, surgical approaches and repair of thoracic injuries are discussed and the available literature.

References: Michael JJ, Fabio Luison. Delayed presentation of traumatic parasternal lung hernia. *Ann. Thorac. Surg.* 1998; 65:1150-1151. Gary SA, Ronald PF. Traumatic lung herniation. *Ann. Thorac. Surg.* 1997; 63:1455-1456. Loic LL, Pierre Mathieu B., François P., Louis B., Rene J., Traumatic extrathoracic lung herniation. *Ann. Thorac. Surg.* 2002; 74:927-929. Szentkereszty Z., Boros M., Sapy P., Kiss S., Surgical treatment of intercostals hernia with implantation of polypropylene mesh. *Hernia* 2006 8;10:345-346. S. Wiens, I. Hunt, J. Mahood, A. Valji, K. Stewart and E.L.R. Bedard. Novel fixation technique for the surgical repair of lung hernias. *Ann. Thorac. Surg.*, September 1, 2009; 88 (3):1034-1035. D. Rice, N. Bikkasani, R. Espada, K. Mattox, and M. Wall. Seat belt-related chondrosternal disruption with lung herniation. *Ann. Thorac. Surg.*, June 1, 2002; 73 (6):1950-1951. A. Arslanian, A. Oliaro, G. Donati, and P.L. Filosso. Posttraumatic pulmonary hernia. *J. Thorac. Cardiovasc. Surg.*, September 1, 2001; 122(3):619-621. L. Lang-Lazdunski, P.-M. Bonnet, F. Pons, L. Brinquin, and R. Jancovici. Traumatic extrathoracic lung herniation. *Ann. Thorac. Surg.*, September 1, 2002; 74(3):927-929.

Disclosure: No significant relationships.

PT037 Traumatic Abdominal Wall Hernia Following Blunt Trauma: A Case Report and Review of the Literature

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Introduction: A TAWH (traumatic abdominal wall hernia) is defined as defect of the abdominal wall musculature and fascia with or without primary skin injury, resulting in a hernia. We describe the case of a patient admitted with TAWH following blunt trauma.

Material and Methods: Retrospective review of a single case

Results: A 51-year old patient was admitted after falling down 9 meters from a silo and landing on his right side. He immediately felt pain and tenderness in the right lower quadrant. Clinically, a superficial skin lesion with an underlying palpable tumor was found. Following primary survey, a CT-scan was performed revealing multiple craniofacial fractures, a contusion of the right lung as well as free intraabdominal fluid and a herniation of a small bowel loop with a fist-sized defect of the entire abdominal wall in the right lower quadrant. Immediate laparotomy was performed. Intraoperatively a traumatic rupture of the meso of the terminal ileum was found. Adjacent, the lateral abdominal wall was ruptured to the subcutaneous tissue. Resection of the harmed Ileum of 20 cm length followed by direct anastomosis and closure of the meso defect ensued. Then, continuous closure of the peritoneal perforation on the lateral abdominal wall was performed using vicryl-0. Following exploration

of the hernia from the outside, débridement and closure layer-by-layer with Maxon-0 was performed. The postoperative course was uneventful.

Conclusion: A TAWH after blunt trauma is a rare entity. The reported incidence of acute hernia ranges from 02, %-3,6%¹. In our case the TAWH was already diagnosed in the trauma room. Mahajna et al.² reported the case of herniation of the right colon with vessel strangulation, which wasn't seen in the primary survey. A right hemicolectomy had to be performed on the 2nd posttraumatic day. In our case we decided intraoperatively to perform a primary reconstruction of the abdominal wall without mesh repair. The potential advantage of a mesh implantation lies in the augmentation of the abdominal wall, thereby potentially lowering the risk of incisional hernia. However, the benefits of such augmentation should be cautiously weighed against the risk of foreign body contamination when resecting bowel during the same operation.

References: 1) Ryan W. Dennis, Andre Marshall, Harshal Deshmukh et al. Abdominal wall injuries occurring after blunt trauma: incidence and grading system. *Am J Surg* 2009;197:413-417 2) A. Mahajna, A. Ofer, M.M. Krausz. Traumatic abdominal hernia associated with large bowel strangulation: case report and review of the literature. *Hernia* 2004;8:80-82

Disclosure: No significant relationships.

PT038 Perineal Impalement – Case Report and Algorithm in Management of Impalement Injuries

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Introduction: Impalement is an uncommon and spectacular injury, which combines aspects of both blunt and penetrating trauma. Impalement injuries from falls are rarely seen, because most of the patients die at the scene of injury. We present an unusual case in which a patient survived a perineal impalement after a fall. With reference to our latest case and discuss the initial management and the operative treatment of this rare injury according to a literature review.

Material and Methods: A young man was working on a construction site when he suddenly lost his footing and fell 7 m off a scaffold. He orientated such that he landed in a sitting position on a vertical aluminium u-tube, which penetrated his perineal region and stucked. Upon arrival at the emergency room he was in stable condition, intubated. After the initial treatment and diagnosis according to ATLS a CT of the abdomen was performed; it showed a penetrating tube perianal left, from caudal into the cavity of the pelvis, the point of the tube stucked in the sacrum – in the hole of neuroforamina S1. There was no intraabdominal or laceration. The patient was taken to the operating room in stable condition. The laparotomy was performed. There was no laceration detected, exploring the praesacral cavity brought out a profuse bleeding of the main pelvic vein. After the active bleeding was stopped the tube was removed from the outside. After lavage and positioning of drains, a protective loop-ileostoma was placed to avoid further contamination. The perineal wound was carefully debrided, drains were inserted and the wound

was not completely closed by adapting stitches. A wash-out of the colon was performed, he received antibiotics and the perineal wound was rinsed daily. He was dismissed 18 days post-trauma.

Results: Impalement injuries result when a solid object pierces a body cavity or extremity. The object often remains fixed within the body. This case report showed a positive outcome. Impalement injuries are impressive but also rare, so it is important to show an algorithm in management of such injuries. The object should be in situ during transport. In large or immoveable objects, the impaling device should be cut just above the skin. The management of the injuries depend on the particular body region of penetrating. Perineal impalement often appear quite complex. These injuries may need the assistance of gynecology and urology surgery Praesacral drainage and distal rectal washout is recommended. Wound care is essential in the care of impalement injuries. The skin should generally left open. Even uncomplicated wounds have to be treated with antibiotics.

Conclusion: Impalement injuries are rare and treating is a challenge for the surgeon. The degree of the injury determines the functional result. Strict adherence to the transportation and management principles outlined in this paper are necessary to decrease morbidity and mortality

Disclosure: No significant relationships.

PT039 Anorectal Trauma And Foreign Bodies

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Introduction: The insertion of foreign objects into the anus and rectum is a well-known phenomenon. Rectal foreign bodies can present a difficult diagnostic and management dilemma. A foreign body may be inserted by a doctor for diagnosis or treatment like rectal thermometer, enema tubes or anal packs, by the patient for self eroticism or by a third party as a result of assault or sexual activity, but the most common cause for insertion of a foreign body is sexual stimulation.^{1,2,3} . Anorectal foreign bodies are more common in men than in women . They can be caused by a wide variety of objects, lead to variable degrees of local trauma to the surrounding tissues, rectal bleeding and can be associated with perforation or delayed injury.

Material and Methods: In this study, In the ten years from 1999 to 2009, we used the medical records of 7 patients with foreign bodies in the rectum have been diagnosed and treated, at Izmir Teaching and Research Hospital, Izmir.

Results: All patients were men. They ranged in age from 33 to 68 (mean age 48). Two of these 7 patients had impulse body spray, two patients had bottle, one patient had eggplant, one patient had brush and one patient had wishbone (after oral ingestion) in the rectum. Five objects were removal transanally extracted by anal dilatation under general anesthesia. Two patients required laparotomy. One patient of these the object was high lying in the rectosigmoid and performed laparotomy. The object was removal transanally extracted by abdominal manipulation. One patient had a intraperitoneal rectosigmoidal perforation. The perforation was treated by primer suture, proximal colostomy and appropriate antibiotic therapy. Routine rectosigmoidoscopic examination is performed after removal. One patient had perforation of the rectosigmoid and 4 had lacerations of the mucosa. No patient had a mortality.

Conclusion: Foreign bodies in rectum should be managed in a well-organized manner. The diagnosis is confirmed by means of plain

abdominal radiographs and rectal examination. Manual extraction without anaesthesia is usually only possible for very low lying objects. Patients with high lying foreign bodies generally require general anaesthesia to achieve complete relaxation of the anal sphincters to facilitate extraction. Open surgery should be reserved only for those patients with perforation, peritonitis and impaction of the foreign body.

References: References 1- Huang WC, Jiang JK, Wang HS, Yang SH, Chen WS, Lin TC, Lin JK. Retained rectal foreign bodies. *J Chin Med Assoc*, 2003;66:606-611. 2- Lake JP, Essani R, Petrone P, Kaiser AM, Asensio J. Management of retained colorectal foreign bodies: Predictors of operative intervention. *Dis Colon Rectum* 2004; 47:1694-8. 3- Clarke DL, Buccimazza I, Anderson FA, Thomson SR. Colorectal foreign bodies. *Colorectal Dis*. 2005;7:98-103.

Disclosure: No significant relationships.

PT040 Traumatic Pneumothorax and Neuperitoneum. The Air is Inside or Outside? Non Surgical Treatment of Pneumoperitoneum

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Introduction: Pneumoperitoneum following trauma usually indicates the presence of a perforated intra-abdominal viscus and the need for laparotomy. Other causes of pneumoperitoneum demonstrate the alternative routes that air can take into the peritoneal cavity: through the abdominal wall, through the diaphragm, through the female genital tract and through the retroperitoneum. Recognising that air may have taken one of the alternative routes into the peritoneal cavity can avoid unnecessary laparotomy.

Material and Methods: We present two cases of blunt thoraco-abdominal trauma, with CT findings of massive pneumothorax with large amount of abdominal free air. These cases showed two different possibilities of localization of intra-abdominal free air associated with traumatic pneumothorax. In the first patient the abdominal free air was completely extraperitoneal, spread into the preperitoneal sub-fascial space through the pre-diaphragmatic and preperitoneal space, whilst in the second case the free air was intraperitoneal but again not caused from a perforated viscus and related to the traumatic

pneumothorax with right diaphragmatic rupture. The first was correctly identified and conservatively managed. The second patient taken to OR for exploratory laparotomy and repair of the diaphragmatic tear.

Results: In the first patient the latest CT showed reduction of the free air, spreading downwards until reached the base of the scrotum. His conditions improved the following day and the further hospital stay was uneventful, discharged from ICU after 48 hours and went home after 8 days. The second patient improved after 20 days in TICU and mechanical ventilation for lung traumatic contusion. He was discharged after 48 days.

Conclusion: Extraluminal intra- or retroperitoneal air is not diagnostic of bowel perforation. Although bowel perforation is a major source of this finding, barotrauma and mechanical ventilation can result in air below the diaphragm. Prerequisites for nonsurgical treatment of pneumoperitoneum after blunt trauma are: (1) a thorough physical examination, (2) no peritoneal signs, (3) pneumothorax, (4) negative diagnostic peritoneal lavage and gastrointestinal swallow series, (5) no intraperitoneal effusion on ultrasonography or CT scan, and (6) close observation with repeated physical examinations and ultrasonography.

References: Cook DE Upper abdominal trauma: pitfalls in CT diagnosis *Radiology* 1986; 159:65-69 Hamilton P Significance of intraabdominal extraluminal air detected by CT scan in blunt abdominal trauma *J Trauma* 1995;39:331-333 Krausz M Pneumoperitoneum associated with pneumothorax: a surgical dilemma in the posttraumatic patient *J Trauma* 1977;17:238-240 Masayoshi N Pneumoperitoneum and neumoretroperitoneum in Blunt Trauma Patients *J Trauma* 49(3):565-566, 2000

Disclosure: No significant relationships.

PT041 Changing Patterns for Abdominal Trauma in Miguel Servet University Hospital: Decreasing Surgical Procedures in Favour of Conservative Treatment (2003-2008)

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Introduction: Aragon is a region that has 1,277,471 inhabitants, of whom 50.8% live in Zaragoza (1). Miguel Servet University Hospital (MSUH) serves the Health Sector II with 367,110 inhabitants. Besides, it is the main reference for the whole community and even for neighbouring provinces in trauma care. Therefore, there is a perception that our changing standards in abdominal trauma surgery should be significant in the regional health context.

Material and Methods: Due to the approval of the decree 2001, management of all hospitals in the Region of Aragon has been transferred to its Government. As a consequence, a hospital discharges with CIE-9 codes MC data base is available. This information, added to other hospital medical records, has enabled to carry out a retrospective study of clinical management for abdominal trauma in the MSUH between 2003 and 2008. Cases of con-

servative treatment and more frequent surgical procedures are reviewed.

Results: In a period of 6 years there were 262 cases coded as abdominal trauma, of whom most were men (72%). Among all patients, 43% have been operated. The most common diagnoses were splenic injury (78), liver injury (66) and bowel injury (61). Additionally, the most frequent procedures were splenectomy (33), bowel resections (44) and liver surgery (14). We analyze morbidity, mortality and surgical changing rules in abdominal trauma from a diachronic point of view.

Conclusion: There is a decreasing trend in the number of surgical procedures in favour of conservative treatment.

Disclosure: No significant relationships.

PT042 Selective Nonoperative Management of Abdominal Visceral Lesions vs. Nontherapeutic Laparotomy in Polytrauma Patients

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Introduction: Nontherapeutic laparotomies (NTL) are described in trauma literature with a frequency of 1,7-38%, depending of the varying protocols of different trauma centers. (1) The morbidity associated with a NTL is appears in 2,5-41% of cases. (2) Selective nonoperative management (NOM) of abdominal injuries is one of the major changes in trauma of the last decades. Aim: To determine the frequency and early morbidity associated with a NTL vs. NOM.

Material and Methods: Prospective observational study of polytrauma patients who received a nontherapeutic/unnecessary laparotomy or NOM in our Trauma Center between Sept.08-Sept.09.

Results: Out of 54 polytrauma patients there were M/F = 33/21. All were blunt trauma. There were 83,3% traffic related trauma, 11,1% falls and 5,6% human aggression. In 3 cases NOM failed. (FNOM) NOM/NTL/FNOM = 38/12/3 cases. Mean age was NOM/NTL = 37,3 ± 17/26,2 ± 13 (p = .05) Mean ISS was NOM/NTL = 19,6/27,5 (p = .033) Mean TRISS was NOM/NTL = 91,6/92,6. (p > .05) Hemodynamic instability was used only in 3 cases of NTL as a indication for surgery. Median ICU stay was NOM/NTL/FNOM = 0/4,5/15. (p = .00) The median in-hospital stay was MNO/NTL/FNOM = 6,8/8,9/18 days. (p = .00) 3 NTL, 1 FNOM and none NOM patients died. (p = .003)

Conclusion: NOM patients have a short in-hospital and ICU stay, without a statistical difference in ISS. When NOM failed is followed by a significant morbidity, compared to NTL. There are still necessary better protocols for NOM in polytrauma setting.

References: 1. Demetriades D, Velmahos G. Technology-Driven Triage of Abdominal Trauma: The Emerging Era of Nonoperative Management. *Annu. Rev. Med.* 2003;54:1-15.

2. Renz B, Feliciano D. Unnecessary laparotomies for trauma: a prospective study of morbidity. *J Trauma.* 1995;38:350-356.

Disclosure: No significant relationships.

PT043 Conservative Treatment of Blunt Abdominal Injuries in the District Hospital

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Introduction: The aim of our workshop is to examine the effectiveness of the conservative treatment of blunt abdominal injuries by using modern diagnostic approaches that allow early and accurate diagnosis in the ER.

Material and Methods: Method and Material : between 24-9-2005 and 9-9-2009, 52 patients were admitted in our hospital suffering of blunt abdominal injuries. 14 patients had liver injuries, 12 patients unilateral kidney injuries, 10 patients suffering of injuries of the spleen, 8 patients had injuries in the retroperitoneal space and 8 patients suffered injuries in the hypogastrium. In all the above patients a CT scan was performed within an hour of their admitted time with the use of contrast media iv, per os or/and per rectum. The main criteria for conservative treatment of blunt abdominal injury in our department are: haemodynamic stability of the patient, evaluation of the extent of the injury using CT scan, lack of any other types of injury that require immediate intervention, absence of signs of peritonism, limited volume of transfused blood and limited volume of haemoperitoneum (200-500 cc).

Results: Results : Out of the 14 patients suffering of liver injuries 10 patients had Grade 1,2 and Grade 3 liver injuries and were treated conservatively. 4 patients had Grade 4 and 5 liver injuries and were operated. 1 patient who was initially managed conservatively was operated due to inability to control the blood loss. Out of the 10 patients suffering injuries of the spleen, 4 were grade 4 and grade 5 and were successfully operated and 6 were grade 1 and 2 and were treated conservatively. All patients suffering of injuries of the retroperitoneal space, unilateral kidney injuries and injuries of the hypogastrium were managed conservatively.

Conclusion: blunt abdominal injuries can be managed successfully and safely by conservative treatment whenever it is allowed by the circumstances. The CT scan is a very sensitive diagnostic scanning, capable of diagnosing intrabdominal haemorrhages retroperitoneal lesions as well as the extent of the organ injury and is a necessary tool for the physician in order to diagnose accurately any abdominal injury.

Disclosure: No significant relationships.

PT044 Blunt Abdominal Trauma: Six Cases of Success With Non Operative Management of Associated Hepatic and Renal Lesions. A Multicentric Experience

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Introduction: More and more hepatic injuries are treated non operatively if the hemodynamic's and lesion's stability is confirmed. The count and the scaling of lesions doesn't directly influence surgical indications. We report about 6 cases of blunt trauma with serious hepatic and renal lesions treated successfully with a non operative management

Material and Methods: We treated 6 liver and renal injury associated in a period from 2007 to 2009. Patients were admitted to Tor Vergata -Roma and Hospital Universitario Clínico San Carlos- Madrid. Data collected were: age, sex, comorbidities, sequence of events, type and number of associated lesions, management, morbidity and mortality. All liver and renal organ's injuries were evaluated by abdominal CT scan with contrast and classified according to CT-based scale

Results: Middle age was 36 ± 11 SD years. Patient were male in (66,6%) of cases. CT scale of liver lesion was 3° for 4 (66,6%) patient and 4° for two (33,3%) patients. Renal lesions were I° category in 5 cases (83,3%) and II° category in 1 patient. No ureteral or major vessels rupture were founded. All patients have been treated non operatively. A CT based follow up of lesions was planned (at admittance, after 48 hours, after a week and after a month). The mean length of hospitalization was 12 ± 6 SD days. During hospitalization, patients were monitored by clinic and labs daily. All patients were dismissed in good conditions and are in health on a 6 months follow up. At CT follow up, one patient presented an intra-hepatic biloma, that was successfully treated with CT-guided drainage

Conclusion: This work support the hypothesis that the association of liver and renal lesions in a blunt abdominal trauma, doesn't necessarily influences indications for an explorative laparotomy. If an ureteral rupture is suspected, a more aggressive treatment is necessary, in order to prevent peritonitis

References: 1. C. Henderson, S. Sedberry-Ross, R. Pickard, D. Bulas, B. Duffy, D. Tsung, M. Eichelberger, A. Belman, H. Rushton "Management of High Grade Renal Trauma: 20-Year Experience at a Pediatric Level I Trauma Center". The Journal of Urology, Volume 178, Issue 1, Pages 246-250. 2. Frank Hildebrand, Michael Winkler, Martijn van Griensven et al. "Blunt Abdominal Trauma Requiring Laparotomy: an Analysis of 342 Polytraumatized Patients" European Journal of Trauma 2006. 32: 5; 430-438 3. George C. Velmahos, MD, Konstantinos Toutouzas, MD e Randall Radin, MD. High Success With Nonoperative Management. Arch Surg. 2003, Vol. 138, p. 475-481.

Disclosure: No significant relationships.

PT045 Blunt Abdominal Trauma. 5 Year Experience In Our Department

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Introduction: The aim of this study is to analyze the most frequent mechanisms of injury, the evaluation in the emergency department and the period of increase of the blunt abdominal trauma incidence.

Material and Methods: During the last 5 years (2005- 2009) 147 patients were admitted to our department for blunt abdominal trauma.

The most frequent mechanisms of injury were: traffic accidents (automobile crashes and motor vehicle collisions)110(74,8%) Work accidents 26(17,6%) 3. Others (fall from high altitude, beating) 11 (7,5%) We analyzed the most frequent injuries observed, the final treatment for these patients and the period of increase of blunt abdominal trauma.

Results: The peak incidence occurs in persons aged 18-42 years. The male/female ratio was 7:3. The most frequent abdominal injuries regarded: Spleen 113(76,8%), liver 24(16,3%), large bowel 5 (3,4%), small bowel 3 (2%), pancreas2 (1,35%).134 patients underwent surgical treatment (91,15%). The incidence of missed injuries is quite low, one case with pancreatic injury and one with small bowel injury. During summer period a significant increase in blunt abdominal trauma incidence occurs because of the increase of population due to tourism. The initial physical examination, after appropriate primary survey and initial resuscitation with the help of diagnostic studies such as ultrasonography, abdominal CT scan, is essential for the final treatment for these patients, operative or not operative.

Conclusion: Lethality of blunt abdominal trauma directly depends on the immediate diagnostic evaluation. The knowledge of ATLS and the experience are important for the survey of these patients.

Disclosure: No significant relationships.

PT046 The Intraabdominal Injury Management in Polytrauma Patients

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Introduction: Background. The treatment of polytrauma necessitates interdisciplinary approach and the variety of imagistic techniques, management protocols as well as minimally invasive approaches greatly influences the trauma service. Aim. To ameliorate the surgical tactics in cases of intraabdominal organ injury in polytrauma patients.

Material and Methods: The treatment results of 895 polytrauma pts. during a 10 year period, presenting abdominal injuries were analyzed. 371(41.5%) were hemodynamically unstable, 524(58.5%) – stable, 140(15.6%) – Glasgow score < 11. In 393(43.9%) immediate surgery was performed along with resuscitation procedures. In 363(92.37%) laparotomy was performed, thoracotomy - 16(4.07%), concomitant brain and limb surgery - 23(5.8%). Urgent surgery was performed in 350(69.72%) hemodynamically stable pts. A group of patients with solid organ injury were managed non-operatively. Elective surgery was performed predominantly for limbs and thoracic cage fractures.

Results: Overall lethality was 19.9%, postoperative death rate – 21.12%, being significantly higher in cases of immediate surgery ($p < 0.001$).

Conclusion: The order of surgical procedures in polytrauma pts is determined by the severity of predominating trauma and life-threatening complications. An absolute indication for laparotomy, these being the first choice surgery, allows surgery for other anatomical regions as the second choice. The adequate antishock therapy on admission as well as improved surgical management in polytrauma pts. including equipment, treatment modalities, time for surgery influences the prognosis and outcome.

Disclosure: No significant relationships.

PT047 What Characteristics of Thoraco-Abdominal or Abdominal Trauma With Intraperitoneal Hemorrhage Will Effect the Patient's Survival

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Introduction: The management of thoraco-abdominal trauma has undergone tremendous revolution in the last decades with significant reduction in mortality in developed countries. The aim of this report is to highlight the management of patients with multiple organ injuries in a teaching hospital in Izmir, western Turkey.

Material and Methods: We conducted a comprehensive study of 128 patients that were managed surgically for intraperitoneal hemorrhage between 2004 and 2009. Information regarding demographics, mechanism of injury, haemodynamic status at presentation, shock, intraoperative findings and outcome, were extracted from case files.

Results: The female to male patient-ratio was 1 to 6 and median age was 47.4 years. While sixty (46%) patients had penetrating trauma, 38(29%) and 28(21%) patients had blunt trauma and gun-shot injury. Abdomino-thoracic injuries were found in 23(17%) patients. Abdominal organ injuries were found in decreasing frequencies in small bowel(29%),liver (26%),large bowel (21%), spleen (18%), major vascular, stomach and others. Thoracic injuries were found in lung and heart in 21 and 2 cases. One organ injury was found in 39(30%) patients, mostly small bowel, and these group had a good haemodynamic status. Thirty-two(25%) patients had two organ injuries which 6 of them associated with lung injury. Three, 4 and < 4 organ injuries were found in 13, 2 and 3 patients. Haemodynamic instability at presentation, and shock was found in five patients (1, 2 and 3 organ injury in 2, 1 and 2 cases). The overall mortality was found in 8(6%) patients. Mortality from gun injury was 50% from major vascular injury 2, lung, pancreas and large bowel 1, lung and large bowel one. Mortality from penetrating trauma was 40% from lung and multiple abdominal organ injury 1, heart 1, lung, spleen and stomach injury 1 and major vascular injury from blunt trauma in one (10%) patient. Five patients who remain haemodynamically unstable after resuscitation died intraoperative period. These group was not received some resuscitation, and they referred to our hospital later than 8 hours of injury.

Conclusion: The mortality from intraperitoneal hemorrhage due to thoraco-abdominal or abdominal organ injury was avoidable if the patients received resuscitation and presented early in the presence of a organised transport and trauma system.

Disclosure: No significant relationships.

PT048 Surgical Management of Patients After Clinical Death with Blunt Trauma

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Introduction: The increase of technogenic and natural disasters, acts of terrorism and armed conflicts is accompanied with a great number

of damaged persons with blunt trauma. There were observed wounded patients with blunt trauma who was operated after clinical death between 2000 and 2008 in War Conflict in Chechnya. We have analyzed the results of surgical treating of wounded men depending on surgical tactics.

Material and Methods: There were observed wounded patients with blunt trauma who was operated after clinical death between 2000 and 2008 in War Conflict in Chechnya. We have analyzed the results of surgical treating of wounded men depending on surgical tactics. After clinical death were operated 24 (10,2%) men with blunt and combat trauma. All patients were males. The mean of age was 22,5 ± 1,6 years. The mean injuries severity score was 41,5 (range 27-75). Urgent surgery was performed in all patients after stabilization systolic pressure for 90 mm and pulse. In 5 cases (20,8%), we used early total care and all of the patients were died. In 19 (79,2%) cases we used damage control surgery. Damage control thoracic surgery (for cardiac and lung injuries) was performed in 4 (21,1%) cases. Damage control for abdomen injuries (liver – 8, small bowels – 6, colon – 6, stomach – 4) was performed in 12 (63,2%) cases. Damage control orthopedics injuries (pelvis – 2, femur – 12, tibia – 6 and main vascular structure in 6 patients) was performed in 17 (89,5%) cases. Damage control surgery for burn injury associated with other trauma was performed in 6 (31,6%) cases.

Results: Three (15,8%) patients died after Damage control surgery. Other 16 (84,2%) men survived and transferred to a major trauma center.

Conclusion: Damage control surgery allowed to save life in 84,2% cases after clinical death.

Disclosure: No significant relationships.

PT049 Driver and Front Seat Passenger Fatalities Related to the Lap Belt – Intestinal Injuries Associated with Lumbar Fractures

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Introduction: The use of seat belts has reduced the overall mortality associated with motor vehicle crashes. In contrast, this utilization has been associated with a multitude of abdominal and spinal injuries, defined as “the seatbelt syndrome”.

Material and Methods: The aim of the study is to prospectively evaluate the incidence of intestinal and spinal injuries to the patients with a “seatbelt mark”. A consecutive series of 109 adult motor vehicle accidents were studied between January 2004 and December 2007. The criteria for the analysis and selection were the use of seatbelts and the presence or absence of a seatbelt mark on admission. The diagnosis and the lesions inventory were established using the computed tomography or MR imaging, ultrasonography and operative findings.

Results: The records have shown that 18 of 109 (16,5%) presented an abdominal seatbelt sign. Of these 18 patients, 12 (67%) had abdominal injuries, 8 (44%) required surgical intervention and 5 (28%) had small bowel perforation; additionally, in 3 cases, it is noted a Chance fracture of lumbar spine. In opposition, the patients without a seatbelt mark (91 cases) presented only in 10% an abdominal injury, 8 laparotomies (8,8%), 4 small bowel perforations

(4,4%), without spinal fractures. Resection/anastomosis was performed in all cases with small bowel perforation or devascularization. Delayed diagnosis of small intestine injuries is related to higher mortality and morbidity. In first group, there were 3 deaths (16,6%), 2 cases due to intestinal injuries. The second group (without seatbelt sign) had 8 deaths (8,8%), none due to intestinal injuries but related with multiple thoracic and cranial lesions.

Conclusion: In this study we found a consistent evidence that “seatbelt sign” is associated with a high incidence of the abdominal (intestinal) and spinal injuries. The abdominal examination may be unreliable because of the presence of associated extra-abdominal injuries. Timely operative intervention minimizes morbidity and hospital stay.

References: 1. Frick EJ Jr, Pasquale MD, Cipolle MD. Small-bowel and mesentery injuries in blunt trauma. *J Trauma* 1999;46:920-926. 2. Crandall CS, Olson LM, Sklar DP. Mortality reduction with air bag and seat belt use in head-on passenger car collisions. *Am J Epidemiol* 2001;153:219-224. 3. Thompson NS, Date R, Charlwood AP, et al. Seat-belt syndrome revisited. *Int J Clin Pract*. Oct 2001;55(8):573-5. 4. Greingor JL, Lazarus S. Chest and abdominal injuries caused by seat belt wearing. *South Med J*. 2006 May;99(5):534-5. 5. Velhamos G, Tatevossian R, Demetriades D. The seat belt mark sign. *Am Surg* 1999;65:181-185. 6. Wotherspoon S, Chu K, Brown A. Abdominal injuries and the seat belt sign. *Emerg Med* 2001;3:61-65.

Disclosure: No significant relationships.

PT050 Duodenopancreatic Trauma in Motorcycle Sports – Case Report

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Introduction: Blunt abdominal trauma is very frequent in motorized sports, mostly in motorcycle or 4x4 motorcycle. In this type of trauma we can find duodenum and pancreatic trauma between the most dangerous and difficult to treat, in most cases needing a surgical approach, leaving to the surgeon the difficult decision of what to do and how aggressive to be, knowing the bad prognosis of this type of trauma and surgery.

Material and Methods: The authors bring a case of a 20 year-old Trauma victim, resulting from a 4x4 motorcycle accident, with abdominal collision. At admittance hemodynamically stable, complaining of abdominal pain and with the transversal impression of a chain in the superior quadrants of the abdomen. No alterations were found during the preliminary examinations, with the exception of a small peritoneal spill in the ultrasound. After various abdominal examinations were performed, peritoneal irritation became visible and laparotomy was suggested, which the patient accepted. During surgery duodenal and pancreatic trauma were discovered together with 900 cc hemoperitoneum, without apparent serious damage to the two organs. A decision was made to operate in the form of damage control – pyloric exclusion, gastro-jejunostomy and drainage. During the first week the patient started to accumulate a large quantity of peritoneal liquid, two pancreatic pseudocysts had formed and there was a bilateral pleural spill. Bilateral tube thoracostomy and

transabdominal drainage of the ascite were performed with the aid of ultrasound.

A slight clinical improvement was observed, but the patient contracted jaundice, resulting in an MRI which confirmed the presence of two pancreatic pseudocysts, one of which was in contact with the duct of Wirsung and the other compressing the main biliary duct. Reoperation with the intention of draining the pseudocysts internally was impossible due to the fact that there was an anatomical distortion, therefore external draining was performed, resulting in a gradual reduction of the drainages and a remarkable clinical improvement. After two years of close follow-up, the patient was clinically cured and without any complication.

Results: The lesions were treated without need of more aggressive measures like duodenopancreatectomy, and patient resumed is normal life and job without any limitations.

Conclusion: Damage control surgery principles are valid in trauma surgery and can be used in some types of trauma where conventional approach's can be difficult and carry poor prognosis.

Disclosure: No significant relationships.

PT051 Pancreatic Trauma Due to Maneuvers in a Difficult Birth: A Rare Case

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Introduction: Retroperitoneal location of the pancreas makes the diagnostic of any traumatism to be difficult, especially when this is not suspected. We report on a case of blunt pancreatic trauma with 6 months delayed diagnosis, after injury due to maneuvers in a difficult birth.

Material and Methods: We report on a case of a twenty-nine year-old female who consulted at the emergency department for constant right upper quadrant pain that didn't ease with any analgesic prescribed by the general practitioner. These symptoms started after a birth six months before and loss of 15 Kg of weight was associated. After reviewing the previous history of the patient, the birth had been difficult and forceps, suction pad and repeated abdominal pressure maneuvers were needed. Abdominal examination showed a painful non-pulsatile mass located at epigastrium and both right and left upper quadrants. Abdominal ultrasonography and enhanced CT-scan were performed and demonstrated the presence of multicystic 15x14x11 cm mass located between the stomach, spleen and left kidney. The high density content seemed to be blood. The mass was pushing the stomach anteriorly and no communication between both of them was shown. The splenic vein was pushed superiorly and thinned and plenty collateral circulation was evidenced. The tail and the body of the pancreas were not identified in any of the studies. The first choice diagnosis was posttraumatic complicated (with bleeding) pancreatic pseudocyst. The patient underwent emergency operation and a big cystic pancreatic mass was encountered, with plenty of collateral circulation. Intraoperative biopsy confirmed that it was a pseudocyst and therefore, the majority of the cyst was removed and Roux-en-Y pancreatojejunostomy was performed. Cholecistectomy was also done.

Results: Definitive pathological examination confirmed the diagnosis of pancreatic pseudocyst. The patient postoperative outcome was unremarkable and was discharged from the hospital at the seventh postoperative day.

Conclusion: Retroperitoneal and “well protected” location implies that a high energy traumatism is needed to injury the pancreas. The fact that in this case a non-classical injury mechanism has occurred, makes the diagnosis more difficult to reach. Pancreatic pseudocyst is the most frequent complications in this type of traumatisms.

References: Management strategies in isolated pancreatic trauma.-Lochan R, et al. J Hepatobiliary Pancreat Surg. 2009;16(2):189-96. Epub 2009 Feb 13. Successful treatment for pancreatic injury presented with pancreatic ascites 2 months after a blunt abdominal trauma. Takeuchi D, et al. Hepatogastroenterology. 2008 Sep-Oct;55(86-87):1834-7. Pancreatic trauma-12-year experience from a tertiary center. Thomas H, et al. Pancreas. 2009 Mar;38(2):113-6.

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PT052 Diagnostic and Therapeutic Problem After Blunt Abdominal Trauma due to Complex Genito-Urinal Malformation

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Introduction: We present the case of a 14-year-old female; she was kicked at her abdomen at a discotheque.

Material and Methods: She presented herself at our outpatient department with hypogastric pain, abdominal rigidity, muscular defense and slight protrusion of the abdominal wall; furthermore, multiple surgical scars of former origin were visible. Due to the significant pain, the patient was not able to provide any valuable case history data. Ultrasound verified large amount of free abdominal fluid. Based on the abdominal rigidity and presence of free abdominal fluid, the patient has almost been transferred to the OR for performing an acute laparotomy; but at this very moment, the heteroanamnesis clarified the coexisting genito-urinal malformations and previous surgeries. CT scans have verified the presence and lesion of an artificial urinary bladder developed from the large intestine, albeit the patient's blood circulatory parameters were within the normal range, despite of abdominal rigidity.

Results: The injury has been healed with conservative methods after twice-repeated ultrasound-controlled abdominal drainage, involving an urologist specialist.

Conclusion: In our well-documented case report, we wanted to present a very rare injury, requiring special treatment and causing diagnostic problems.

Disclosure: No significant relationships.

PT053 Reconstruction of a Catastrophic Abdomen: A Challenging Case

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Introduction: Unnoticed traumatic injuries produce avoidable morbidity, mortality and a higher medical cost. We present a special case of the reconstruction of a catastrophic abdomen with several intestinal fistulae and giant abdominal wall defect.

Material and Methods: We present the case of a 26 year old woman with blunt thoraco-abdominal trauma secondary to a road traffic accident. Several lower left rib fractures, a fast echo with free fluid without solid organ injury and fractures of L1 and L2 were seen in the initial assessment. On the third day surgery was required due to septic shock with diffuse peritonitis due to a jejunal laceration and section of the body-tail of the pancreas. Simple suture of the jejunal laceration, distal pancreatectomy, and abdominal packing without closure of the abdomen was performed. She developed several intestinal and colonic fistulae. Over 40 surgical procedures were performed on her and she was discharged 9 months later with night parenteral nutrition, a closed abdomen by secondary intention and intestinal fistulae. She was readmitted a year later for reconstruction. We performed monoblock resection of the abdominal wall and the fistulized loops, subtotal colectomy and bowel transit reconstruction with three enterointerics and an ileosigmoid anastomosis, leaving 1,8 m of small bowel. Abdominal plastia with Permacol mesh was also performed.

Results: Surgical time was of 420 minutes and oral tolerance was initiated on the 7th postoperative day. She was discharged on the 14th day postop. The only complication was a fever secondary to infection a central venous catheter on the 3rd day.

Conclusion: Treatment of the consequences of unnoticed traumatic injuries is a great challenge for the surgeon. The proper choice of timing, approach and correct technique are pivotal for success.

References:

Enterocutaneous fistula complicating trauma laparotomy: a major resource burden. Pedro G R Teixeira; Kenji Inaba; Joseph Dubose; Ali Salim; Carlos Brown. The American Surgeon; Jan 2009;75;1; Proquest Medical Library pg 30. Staged Management of Giant Abdominal wall defects. Acute and long term results. T. Wright Jernigan MD, Timothy CFabian MD, Martin A Croce MD, Natalie Moore IBS, F Elizabeth Pritchard MD, Gayleminard MD and Tiffany K Bee MD. Annals of Surgery; sep 2003;238,3.

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		Pfeifer, Roman	M087	Ranieri, Valerio	PT010
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Panahi, Farzad	PT031	Pons, M.J.	PM032	Reuling, Ellen	M057
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Rosenfeldt, Franklin	S031	Schemitsch, Emil	S056, S057	Sinnis, Gerasimos	S021
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		Sehjal, Ranjit	PS015	Spiridakis, Konstantinos	PT045
		Seibert, Franz	S067	Spirou, Spiros	PT035
		Seil, Romain	S127	Sprovierio, Jorge	S099, M048
		Sekmen, Umit	S015, M094, PT024	Spyridakis, Michael	T030
		Sekulic, Aleksandar	PT006	Stamatakis, Michael	PT020
		Sekulic, Stojan	M095, PT002	Stampfl, Paul	S005, S091
		Sekulic-Frkovic, Aleksandra	M095, PT002	Stary, David	M031, T075
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